

**THE UNITED STATES PATENT AND TRADEMARK OFFICE
BEFORE THE BOARD OF PATENT APPEALS AND INTERFERENCES**

Applicant(s): Yoakim et al.
Appl. No.: 10/728,342
Conf. No.: 8608
Filed: December 3, 2003
Title: SEALED FLEXIBLE CARTRIDGE
Art Unit: 1761
Examiner: Sarah Louise Kuhns
Docket No.: 112701-573

Mail Stop Appeal Brief - Patents
Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

APPELLANTS' APPEAL BRIEF

Sir:

Appellants submit this Appeal Brief in support of the Notice of Appeal filed on August 14, 2006. This Appeal is taken from the Final Rejection in the Office Action dated April 18, 2006.

I. REAL PARTY IN INTEREST

The real party in interest for the above-identified patent application on Appeal is Nestec, Ltd. by virtue of an Assignment dated December 3, 2003 and recorded at reel 014790, frame 0531 in the United States Patent and Trademark Office.

II. RELATED APPEALS AND INTERFERENCES

Appellants' legal representative and the Assignee of the above-identified patent application do not know of any prior or pending appeals, interferences or judicial proceedings which may be related to, directly affect or be directly affected by or have a bearing on the Board's decision with respect to the above-identified Appeal.

III. STATUS OF CLAIMS

Claims 1-2, 4-5, 10-12, 14-16 and 19-20 are pending in this application. Claims 3, 6-9, 13 and 17-18 were previously canceled. Claims 1-2, 4-5, 10-12, 14-16 and 19-20 stand rejected. Therefore, Claims 1-2, 4-5, 10-12, 14-16 and 19-20 are being appealed in this Brief. A copy of the appealed claims is included in the Claims Appendix.

IV. STATUS OF AMENDMENTS

A final Office Action was mailed on April 18, 2006. Appellants filed an amendment after final on July 18, 2006 in reply to the final Office Action. An Advisory Action was mailed on July 26, 2006. In the Advisory Action, the amendments were not entered and the Examiner maintained the previous rejections. A copy of the final Office Action and the Advisory Action are attached as Exhibit A and Exhibit B, respectively, in the Evidence Appendix.

V. SUMMARY OF CLAIMED SUBJECT MATTER

A summary of the invention by way of reference to the specification and/or figures for each of the independent claims is provided as follows:

Independent Claim 1 is directed to a sealed cartridge comprising first and second sheet materials joined to form a space there between (page 1, lines 13-15; page 2, lines 1-3 and 31- 33; page 4, lines 15-18; page 5, lines 1-4), and a beverage-forming substance for preparing a beverage located in the space between the sheets (page 1, lines 9-13; page 2, lines 8-9; page 3, lines 6-8), with the first material designed to admit water into the cartridge for extraction of the beverage from the beverage-forming substance (page 2, lines 3-18; page 3, lines 9-21; page 4, lines 3-6), and the second material having properties to retain the water or beverage in the cartridge until an overpressure of between 0.1 to 3 bar is achieved (page 2, lines 5-8; page 2, line 33 to page 3, line 5; page 3, lines 22-33; page 4, lines 1-14, 19-22 and 30-34; page 5, lines 1-17), at which overpressure the second material will allow the extracted beverage to exit the cartridge (page 2, line 33 to page 3, line 5; page 3, lines 22-33; page 4, lines 1-14, 19-22 and 30-34; page 5, lines 1-17), wherein the first sheet material is selected from the group consisting of paper, a non-woven fiber, prescored plastic material and combinations thereof (page 2, lines 10-11; page 3, lines 9-21) and wherein the second sheet is selected from the group consisting of filter paper, non-woven fiber material, prescored plastic material and combinations thereof having a sufficiently tight mesh to retain water or beverage in the cartridge until the overpressure is reached (page 2, lines 11-13; page 3, lines 22-33; page 4, lines 1-14) and allows the beverage to pass through it by effect of the fluid overpressure alone when the overpressure of between 0.1 to 3 bar is reached (page 2, line 33 to page 3, line 5; page 3, lines 22-33; page 4, lines 1-14, 19-22 and 30-34; page 5, lines 1-17), thus resulting in a delay effect in the passage of the beverage through the second sheet after water has been admitted into the capsule (page 2, line 33 to page 3, line 5; page 3, lines 22-33; page 4, lines 1-14, 19-22 and 30-34; page 5, lines 1-17).

Although specification citations are given in accordance with C.F.R. 1.192(c), these reference numerals and citations are merely examples of where support may be found in the specification for the terms used in this section of the Brief. There is no intention to suggest in any way that the terms of the claims are limited to the examples in the specification. As demonstrated by the references numerals and citations, the claims are fully supported by the

specification as required by law. However, it is improper under the law to read limitations from the specification into the claims. Pointing out specification support for the claim terminology as is done here to comply with rule 1.192(c) does not in any way limit the scope of the claims to those examples from which they find support. Nor does this exercise provide a mechanism for circumventing the law precluding reading limitations into the claims from the specification. In short, the references numerals and specification citations are not to be construed as claim limitations or in any way used to limit the scope of the claims.

VI. GROUNDS OF REJECTION TO BE REVIEWED ON APPEAL

1. Claims 1-2, 4-5, 11-12, 14-16 and 19-20 are rejected under 35 U.S.C. §112, second paragraph.
2. Claims 1-2, 4-5, 11-12, 14, 16 and 19-20 are rejected under 35 U.S.C. §103(a) as being unpatentable over U.S. Patent No. 5,897,899 to Fond (“*Fond*”) in view of U.S. Patent No. 4,136,202 to Favre (“*Favre*”). Copies of *Fond* and *Favre* are attached herewith as Exhibits C and D, respectively, in the Evidence Appendix.
3. Claims 10 and 15 are rejected under 35 U.S.C. §103(a) as being unpatentable over *Fond* in view of *Favre* and further in view of U.S. Patent No. 4,253,385 to Illy (“*Illy*”). A copy of *Illy* is attached herewith as Exhibit E.

VII. ARGUMENT

A. LEGAL STANDARDS

1. Definiteness under 35 U.S.C. § 112, second paragraph

The standard for determining whether the definitiveness requirement is met under 35 U.S.C. § 112, ¶ 2 is “whether those skilled in the art would understand what is claimed when the claim is read in light of the Specification.” *Orthokinetics Inc. v. Safety Travel Chairs Inc.*, 1 U.S.P.Q. 2d 1081-1088 (Fed. Cir. 1986). “If the claims, read in light of the Specification, reasonably apprise those skilled in the art both of the utilization and scope of the invention, and if the language is as precise as the subject matter permits, the Courts can demand no more.” *North American Vaccine Inc. v American Cyanamid Co.*, 28 U.S.P.Q. 2d 1333, 1339 (Fed. Cir. 1993). In this regard, “[p]atent law allows the inventor to be his own lexicographer ... [T]he specification aids in ascertaining the scope and meaning of the language employed in the claims inasmuch as words must be used in the same way in both the claims and the specification. *United States v. Teletronics, Inc.*, 8 U.S.P.Q. 2d 1217, 1220 (Fed. Cir. 1988). By statute, 35 U.S.C. 112, Congress has placed no limitations on how an applicant claims his invention, so long as the specification concludes with claims which particularly point out and distinctly claim that invention.” *In re Pilkington*, 162 U.S.P.Q. 145, 148 (C.C.P.A. 1996).

2. Obviousness under 35 U.S.C. §103

The Federal Circuit has held that the legal determination of an obviousness rejection under 35 U.S.C. § 103 is:

whether the claimed invention as a whole would have been obvious to a person of ordinary skill in the art at the time the invention was made...The foundational facts for the prima facie case of obviousness are: (1) the scope and content of the prior art; (2) the difference between the prior art and the claimed invention; and (3) the level of ordinary skill in the art...Moreover, objective indicia such as commercial success and long felt need are relevant to the determination of obviousness...Thus, each obviousness determination rests on its own facts.

In re Mayne, 41 U.S.P.Q. 2d 1451, 1453 (Fed. Cir. 1997).

In making this determination, the Patent Office has the initial burden of proving a *prima facie* case of obviousness. *In re Rijckaert*, 9 F.3d 1531, 1532, 28 U.S.P.Q. 2d 1955, 1956 (Fed. Cir. 1993). This burden may only be overcome “by showing some objective teaching in the prior art or that knowledge generally available to one of ordinary skill in the art would lead that individual to combine the relevant teachings.” *In re Fine*, 837 F.2d 1071, 1074, 5 U.S.P.Q. 2d 1596, 1598 (Fed. Cir. 1988). “If the examination at the initial stage does not produce a *prima facie* case of unpatentability, then without more the applicant is entitled to grant of the patent.” *In re Oetiker*, 24 U.S.P.Q. 2d 1443, 1444 (Fed. Cir. 1992).

To establish a *prima facie* case of obviousness, three basic criteria must be met. First, there must be some suggestion or motivation, either in the reference or references themselves or in the knowledge generally available to one of ordinary skill in the art, to modify the reference or to combine reference teachings. *In re Fine*, 837 F.2d 1071, 5, U.S.P.Q.2d 1596 (Fed. Cir. 1988). Second there must be a reasonable expectation of success. *In re Merck & Co., Inc.*, 800 F.2d 1091, 231 U.S.P.Q. 375 (Fed. Cir. 1986) Finally, all of the claim limitations must be taught or suggested by the prior art. *In re Royka*, 490 F.2d 981, 180 U.S.P.Q., 580 (CCPA 1974).

Further, the Federal Circuit has held that it is “impermissible to use the claimed invention as an instruction manual or ‘template’ to piece together the teachings of the prior art so that the claimed invention is rendered obvious.” *In re Fritch*, 23 U.S.P.Q.2d 1780, 1784 (Fed. Cir. 1992). “One cannot use hindsight reconstruction to pick and choose among isolated disclosures in the prior art to deprecate the claimed invention” *In re Fine*, 837 F.2d 1071 (Fed. Cir. 1988).

Moreover, the Federal Circuit has held that “obvious to try” is not the proper standard under 35 U.S.C. §103. *Ex parte Goldgaber*, 41 U.S.P.Q.2d 1172, 1177 (Fed. Cir. 1996). “An-obvious-to-try situation exists when a general disclosure may pique the scientist curiosity, such that further investigation might be done as a result of the disclosure, but the disclosure itself does not contain a sufficient teaching of how to obtain the desired result, or that the claimed result would be obtained if certain directions were pursued.” *In re Eli Lilly and Co.*, 14 U.S.P.Q.2d 1741, 1743 (Fed. Cir. 1990).

Of course, references must be considered as a whole and those portions teaching against or away from the claimed invention must be considered. *Bausch & Lomb, Inc. v. Barnes-Hind/Hydrocurve Inc.*, 796 F.2d 443 (Fed. Cir. 1986). “A prior art reference may be considered to teach away when a person of ordinary skill, upon reading the reference would be discouraged

from following the path set out in the reference, or would be led in a direction divergent from the path that was taken by the Applicant.” *Monarch Knitting Machinery Corp. v. Fukuhara Industrial Trading Co., Ltd.*, 139 F.3d 1009 (Fed. Cir. 1998), quoting, *In re Gurley*, 27 F.3d 551 (Fed. Cir. 1994).

B. THE CLAIMED INVENTION

Independent Claim 1 recites, in part, a sealed cartridge comprising first and second sheet materials joined to form a space there between, and a beverage-forming substance for preparing a beverage located in the space between the sheets. The first material is designed to admit water into the cartridge for extraction of the beverage from the beverage-forming substance. The second material has properties to retain the water or beverage in the cartridge until an overpressure of between 0.1 to 3 bar is achieved. Once this overpressure is achieved, the second material will allow the extracted beverage to exit the cartridge. The first sheet material is selected from the group consisting of paper, a non-woven fiber, prescored plastic material and combinations thereof. The second sheet is selected from the group consisting of filter paper, non-woven fiber material, prescored plastic material and combinations thereof and has a sufficiently tight mesh to retain water or beverage in the cartridge until the overpressure is reached. As a result, the beverage passes through the second sheet by effect of the fluid overpressure alone when the overpressure of between 0.1 to 3 bar is reached, thus resulting in a delay effect in the passage of the beverage through the second sheet after water has been admitted into the cartridge.

C. THE REJECTION OF CLAIMS 1-2, 4-5, 11-12, 14-16 AND 19-20 UNDER 35 U.S.C. §112 SHOULD BE REVERSED BECAUSE APPELLANTS PREVIOUSLY AMENDED CLAIM 1 TO ADDRESS THIS INFORMALITY

In the final Office Action, Claims 1-2, 4-5, 11-12, 14-16 and 19-20 were rejected under 35 U.S.C. §112, second paragraph, as allegedly being indefinite for failing to particularly point out and distinctly claim the subject matter that Appellants regard as their invention. In an amendment after final, Appellants amended Claim 1 to change the term “capsule” to “cartridge,”

which has a sufficient antecedent basis. The Examiner did not enter the amendment. To render this rejection moot, Appellants respectfully submit that they will amend Claim 1 to change the term “capsule” to “cartridge” at the next available opportunity.

D. THE REJECTIONS OF CLAIMS 1-2, 4-5, 11-12, 14, 16 AND 19-20 UNDER 35 U.S.C. §103(a) SHOULD BE REVERSED BECAUSE THE EXAMINER HAS NOT ESTABLISHED A *PRIMA FACIE* CASE OF OBVIOUSNESS

1. The cited references fail to disclose or suggest all of the elements of the claimed invention

Independent Claim 1 recites, in part, a sealed cartridge comprising a second sheet material that is selected from the group consisting of filter paper, non-woven fiber material, prescored plastic material and combinations thereof having a sufficiently tight mesh to retain water or beverage in the cartridge until the overpressure is reached and allows the beverage to pass through it by effect of the fluid overpressure alone when the overpressure of between 0.1 to 3 bar is reached, thus resulting in a delay effect in the passage of the beverage through the second sheet after water has been admitted into the capsule. In contrast, Appellants respectfully submit that *Fond* and *Favre* fail to disclose or suggest every element of independent Claim 1.

An advantage of the present invention is that it considerably reduces the complexity of the cartridge because no high strength material designed for a tear face as taught by the cited references is used. For example, the second material of the present claims can deliver the retarded/delayed fluid release effect with a moderate rise in fluid pressure from within the cartridge. Another advantage of the present invention is that there is no more need for external relief/recessed elements that must be used to puncture or rupture a cartridge's tear face thereby further simplifying the system.

Fond fails to disclose or suggest a cartridge with a second sheet made of filter, non-woven fiber or prescored plastic material that allows the beverage to pass through it by effect of the fluid overpressure alone when the overpressure of between 0.1 to 3 bar is reached as required, in part, by Claim 1. Instead, *Fond* teaches a cartridge having a high strength sheet through which the liquid flows through that is designed as a “tear face” with a character of a foil.

See, *Fond*, column 5, lines 49-50. Preference is given to a foil of aluminum or plastic that is impermeable to oxygen. See, *Fond*, column 5, lines 51-52. The “tear face” requires an impinging device to act on the sheet while fluid pressure builds within the cartridge for the sheet to tear. For example, *Fond* teaches that:

In operation, a cartridge (1) is placed in the cartridge holder (11). The support (15) then is fixed by its fastening lugs (17) onto the tightening ramps (10) of the tightening ring (9). The water injector (20) pierces the base face of the cup (2). The cover tear face (4) of the cartridge rests on the radially arranged members (13) of the cartridge holder. The fact that the cartridge holder (11) can be rotated in its support (15) ensures that the cartridge remains fixed in relation to the cartridge holder during locking and unlocking, thus avoiding risk of damage to the cartridge.

The water is introduced through the orifices (20a) of the water injector (20) and impinges on the layer (3) of coffee. The pressure in the cartridge increases and the tear face (4) increasingly follows the shape of the radial opening relief surface members (13). When the constituent material of the tear face reaches its breaking stress, the tear face tears along the radial members. The extracted coffee flows through the orifices of the flow grille (12) and is recovered in a container (not shown) beneath the bore (27).

FIGS. 7a to 7d show different shapes for embodiment of radial relief surface element members (13) integrally with a flow screen grille (12). FIGS. 7a and 7b illustrate a rounded element. FIG. 7a illustrates an element having a flattened surface and curved edges. FIG. 7d illustrates a cross-section of an element which is pyramidal in shape having a flattened top surface.

See, *Fond*, column 15, lines 27-52 (emphasis added.)

In addition, *Fond* fails to disclose or suggest that the second material is filter, non-woven fiber and/or a prescored plastic material as required, in part, by Claim 1. For example, according to the present claims, each of these materials is designed to provide a sufficient barricade for fluids until a moderate fluid pressure within the cartridge is reached before the second material ruptures based on the internal fluid pressure alone (between 0.1 and 3 bar). As a result, the second material ruptures without the need for any impinging or external relief device.

In *Fond*, the cartridge materials used to allow fluid to pass are made and designed to require a much higher pressure before rupturing based on pressure of the internal fluid alone. In fact, *Fond* explicitly teaches that:

As will be appreciated, materials employed for forming the tear face should be such that, when impinged upon the relief surface element the tear faces, in accordance with the invention, is embodied to withstand a pressure in the interior of the cartridge above 1 bar, and particularly such as a pressure within the range of from 2 bar to 15 bar, prior to breaking and tearing, such providing for the phases of extraction discussed further below.

See, *Fond*, column 5, lines 37-44 (emphasis added.)

Because *Fond* teaches a cartridge having a tear face that can withstand pressures up to 15 bar, *Fond* is not concerned with the present invention and actually teaches away from the present claims. Indeed, *Fond* only teaches a closed cartridge with a bottom foil or cover that is meant to be opened only when contacting and tearing against projections of the holder of the machine (e.g. element 13 of Figures 7A-D). See, *Fond*, column 4, lines 8-15. When the pressure reaches a value of between 2 to 15 bars, the cover is pressed against the projections and it reaches its breaking stress and forms a plurality of openings. See, *Fond*, Claim 1 and column 7, lines 10-25. Consequently, the lower face of the cartridge in *Fond* is not designed to break by effect of the fluid pressure alone when the overpressure of between 0.1 to 3 bar is reached.

When considering the presence of paper fibers, *Fond* only mentions the use of a “multi-layer” that combines paper fibers and aluminum. See, *Fond*, column 5, line 61 to column 6, line 23. However, in *Fond*, the layer of paper fibers are not the tear face but are instead an additional component of the tear face. This additional component should keep, as taught by *Fond*, the face integrally intact as the tear face (e.g. aluminum or plastic) tears. Thus, the paper fiber component of the tear face in *Fond* has a support and filtering function whereas the second sheet of the present claims has, for example, a retarded or delayed opening function and resists up to a certain pressure before the beverage is released. As a result, even *Fond*’s use of paper fibers as a component of the tear face fails to teach or suggest a second sheet having a sufficiently tight mesh to retain water or beverage in the cartridge until the overpressure is reached and allowing the beverage to pass through it by effect of the fluid overpressure alone when the overpressure of between 0.1 to 3 bar is reached as required, in part, by Claim 1.

Similarly, *Favre* fails to disclose or suggest a cartridge with a second sheet made of filter, non-woven fiber or prescored plastic material that allows the beverage to pass through it by effect of the fluid overpressure alone when the overpressure of between 0.1 to 3 bar is reached as required, in part, by Claim 1. In addition, *Favre* fails to disclose or suggest that the second material is filter, non-woven fiber and/or a prescored plastic material as required, in part, by Claim 1. Instead, *Favre* teaches a capsule having a barrier membrane made of aluminum, preferably between 30 and 60 μm thick. See, *Favre*, column 1, lines 58-60. Moreover, *Favre* teaches that barrier membrane can withstand pressures of up to 16 bars before breaking, which clearly teaches away from the present claims. See, *Favre*, column 2, lines 20-23.

For at least the reasons discussed above, the cited references, alone or in combination, do not teach, suggest, or even disclose all of the elements of Claim 1 and Claims 2, 4-5, 11-12, 14, 16 and 19-20 that depend from Claim 1, and thus, fail to render the claimed subject matter obvious for at least these reasons.

Accordingly, Appellants respectfully submit that Claim 1-2, 4-5, 11-12, 14, 16 and 19-20 are novel, nonobvious and distinguishable from the cited references and are in condition for allowance.

E. THE PATENTABILITY OF CLAIM 1 RENDERS MOOT THE REJECTIONS OF CLAIMS 10 AND 15

The Examiner in the Final Office Action dated April 18, 2006 alleges that *Fond* in view of *Favre* and further in view of *Illy* render obvious Claims 10 and 15. Appellants respectfully submit that the patentability of independent Claim 1 as discussed previously renders moot the obviousness rejections of Claims 10 and 15 that depend from Claim 1. In this regard, the cited art fails to teach or suggest the elements of Claims 10 and 15 in combination with the novel elements of Claim 1.

VIII. CONCLUSION

Appellants respectfully submit that Appellants' proposed amendment renders moot the rejection of Claims 1-2, 4-5, 11-12, 14-16 and 19-20 under 35 U.S.C. §112, second paragraph. In addition, Appellants respectfully submit that the Examiner has failed to establish a *prima facie* case of obviousness under 35 U.S.C. §103 with respect to the rejection of Claims 1-2, 4-5, 11-12, 14, 16 and 19-20. Accordingly, Appellants respectfully submit that the obviousness rejection is erroneous in law and in fact and should therefore be reversed by this Board.

The Director is authorized to charge \$500 for the Appeal Brief and any additional fees which may be required, or to credit any overpayment to Deposit Account No. 02-1818. If such a withdrawal is made, please indicate the Attorney Docket No. 112701-573 on the account statement.

Respectfully submitted,

BELL, BOYD & LLOYD LLC

BY 

Robert M. Barrett
Reg. No. 30,142
Customer No. 29157

Dated: October 13, 2006

CLAIMS APPENDIX
PENDING CLAIMS ON APPEAL OF
U.S. PATENT APPLICATION SERIAL NO. 10/728,342

1. A sealed cartridge comprising first and second sheet materials joined to form a space there between, and a beverage-forming substance for preparing a beverage located in the space between the sheets, with the first material designed to admit water into the cartridge for extraction of the beverage from the beverage-forming substance, and the second material having properties to retain the water or beverage in the cartridge until an overpressure of between 0.1 to 3 bar is achieved, at which overpressure the second material will allow the extracted beverage to exit the cartridge, wherein the first sheet material is selected from the group consisting of paper, a non-woven fiber, prescored plastic material and combinations thereof and wherein the second sheet is selected from the group consisting of filter paper, non-woven fiber material, prescored plastic material and combinations thereof having a sufficiently tight mesh to retain water or beverage in the cartridge until the overpressure is reached and allows the beverage to pass through it by effect of the fluid overpressure alone when the overpressure of between 0.1 to 3 bar is reached, thus resulting in a delay effect in the passage of the beverage through the second sheet after water has been admitted into the capsule.

2. The cartridge of claim 1 wherein the beverage-forming substance is roasted and ground coffee, soluble coffee, a chocolate beverage forming substance or a mixture thereof.

4. The cartridge of claim 1 wherein the first material is filter paper having a density of 15 to 30 g/m² and a thickness between 0.1 to 1 mm or a non-woven fiber or plastic material having a density of between 20 and 100 g/m² so that it will permit water to enter the cartridge by gravity flow.

5. The cartridge of claim 1 wherein the first material is aluminum having a thickness of 20 to 100 microns and is configured to allow puncturing by piercing means in order for water to be admitted into the cartridge.

10. The cartridge of claim 1 wherein the second sheet includes a removable cover.

11. The cartridge of claim 1 wherein both the first and second sheets are made of a material that acts as an oxygen barrier so that no further packaging of the cartridge is required.

12. The cartridge of claim 1 wherein either or both of the first and second sheets are not made of a material that acts as an oxygen barrier so that a further packaging of the cartridge is required to prevent oxygen deterioration of the beverage-forming substance.

14. The cartridge of claim 2 wherein the first and second sheet materials have a circular, oval, or polygonal shape and the substance is present in an amount of 5 to 10 grams.

15. The cartridge of claim 2 wherein the first and second materials are each made of filter paper.

16. The cartridge of claim 2 wherein the first and second materials each is a non-woven fiber or plastic material.

19. The cartridge of claim 1, wherein the second sheet is made of a non-woven material having a tight mesh allowing water to pass through it when the overpressure inside the capsule reaches 1 bar.

20. The cartridge of claim 1, wherein the second sheet is made of a material having properties to retain the water or beverage in the cartridge when an overpressure of the order of 1 bar is reached within the cartridge during extraction.

EVIDENCE APPENDIX

EXHIBIT A: Final Office Action dated April 18, 2006

EXHIBIT B: Advisory Action dated July 26, 2006

EXHIBIT C: U.S. Patent No. 5,897,899 to Fond ("*Fond*"), cited by the Examiner in the final Office Action dated April 18, 2006

EXHIBIT D: U.S. Patent No. 4,136,202 to Favre ("*Favre*"), cited by the Examiner in the final Office Action dated April 18, 2006

EXHIBIT E: U.S. Patent No. 4,253,385 to Illy ("*Illy*"), cited by the Examiner in the final Office Action dated April 18, 2006

RELATED PROCEEDINGS APPENDIX

None

EXHIBIT A



UNITED STATES PATENT AND TRADEMARK OFFICE

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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/728,342	12/03/2003	Alfred Yoakim	88265-7072	8608

29157 7590 04/18/2006

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EXAMINER

KUHNS, SARAH LOUISE

ART UNIT PAPER NUMBER

1761

DATE MAILED: 04/18/2006

See 7-1806

References Downloaded

Please find below and/or attached an Office communication concerning this application or proceeding.

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APR 21 2006

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Office Action Summary

Application No.

10/728,342

Applicant(s)

YOAKIM ET AL.

Examiner

Sarah L. Kuhns

Art Unit

1761

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --
Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 14 March 2006.
- 2a) ☒ This action is **FINAL**. 2b) ☐ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1,2,4,5,10-12,14-16,19 and 20 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 1,2,4,5,10-12,14-16,19 and 20 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on _____ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
 2. ☐ Certified copies of the priority documents have been received in Application No. _____.
 3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- 1) ☒ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☐ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)
Paper No(s)/Mail Date _____.
- 4) ☐ Interview Summary (PTO-413)
Paper No(s)/Mail Date. _____.
- 5) ☐ Notice of Informal Patent Application (PTO-152)
- 6) ☐ Other: _____.

DETAILED ACTION

The text of those sections of Title 35, U.S. Code not included in this action can be found in a prior Office action.

Claim Objections

Claim 1 is objected to because of the following informalities: "between 0.1 to 3 bar" should be changed to "between 0.1 and 3 bar." Appropriate correction is required.

Claim Rejections - 35 USC § 112

Claims 1, 2, 4, 5, 11, 12, 14-16, 19, and 20 are rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention. Claim 1 recites the limitation "capsule" in the last line. There is insufficient antecedent basis for this limitation in the claim.

Claim Rejections - 35 USC § 103

Claims 1, 2, 4, 5, 11, 12, 14, 16, 19, and 20 are rejected under 35 U.S.C. 103(a) as being unpatentable over Fond, U.S. Patent 5,897,899, in view of Favre, U.S. Patent 4,136,202.

In regard to claims 1, 2, and 20, Fond discloses a sealed cartridge comprising first and second sheet materials joined to form a space there between, and ground

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coffee (3) located in the space between the sheets, with the first material (2) designed to admit water into the cartridge for extraction of the beverage from the coffee, and the second material (4) having properties to retain water or beverage in the cartridge until an overpressure of above 1 bar, and particularly within the range of 2-15 bar, is achieved at which overpressure the second material will rupture under the sole effect of the rise in pressure inside the cartridge to allow the extracted beverage to exit the cartridge (claim 1 and column 5, lines 38-45).

Many of the embodiments disclosed in Fond do not require that the relief surface elements puncture or tear the tear face (see column 8, lines 32-39; column 9, lines 4-16; column 10, lines 11-16 and 37-41). Therefore, it is interpreted that the tear face tears by effect of the fluid overpressure alone. Since the cartridge of Fond functions in the same way as that of Applicant, it would have been expected that the cartridge of Fond would also result in a delay effect in the passage of the beverage through the second sheet after water has been admitted into the cartridge, absent a showing to the contrary by clear and convincing evidence.

Fond discloses that there is no need for score lines in the cartridge (see abstract, "which need have no marks for weakening"), but this does suggest that the inclusion of score lines would interfere with the functioning of the cartridge. The use of score lines was notoriously well known in the art, as evidenced by Favre (column 2, lines 24-25). It would have therefore been obvious to include score lines in the cartridge of Fond in order to better control the tearing pattern of the tear face and also to reduce the overpressure required to break the tear face.

In regard to claim 4, Fond discloses the first sheet (2) being made of a non-woven fiber or a semi-rigid material having a density within the claimed range that will permit water to enter the cartridge by gravity flow (column 6, lines 23-40).

In regard to claim 5, Fond discloses the first material (2) being aluminum with a thickness of at least 20 microns that is configured to allow puncturing by piercing means (20) in order for water to be admitted into the cartridge (column 6, lines 24-26).

In regard to claims 11 and 12, Fond discloses the materials of the first (2) and second (4) sheets be made of oxygen barrier materials or non-oxygen barrier materials (column 6, lines 10-40).

In regard to claim 14, Fond discloses a cartridge that holds 5-20 grams of coffee, wherein the first (2) and second (4) sheet materials have polygonal shape (figures 1-3, column 5, lines 23-36).

In regard to claim 16, Fond discloses the first (2) and second (4) materials each being non-woven material (column 6, lines 23-40 and column 5, lines 49-59).

Claims 10 and 15 are rejected under 35 U.S.C. 103(a) as being unpatentable over Fond in view of Favre, as applied above, in further view of Illy, U.S. Patent 4,253,385.

In regard to claim 10, Fond does not disclose a removable cover. Illy discloses a coffee cartridge comprising first and second sheet materials joined to form a space there between for holding coffee (21) and further discloses a removable cover (column

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2, lines 1-2) for the cartridge. It would therefore be obvious to make the cover of the cartridge of Fond removable in order to make the cartridge reuseable.

In regard to claim 15, Fond discloses the second material (4) being filter paper (column 5, lines 60-65), but does not disclose the first material (2) being filter paper. However, it was well known to one of ordinary skill in the art to use filter paper as both the first and second materials when making a coffee cartridge, as evidenced by Illy (column 2, lines 10-13). Therefore, it would have been obvious to use filter paper as the first material, as well as the second material, since such a material in conventional in the field.

Response to Arguments

Applicant's arguments filed March 14, 2006, have been fully considered but they are not persuasive. Applicant argues that Fond fails to disclose or suggest a capsule with a second sheet material that allows the beverage to pass through it by effect of the fluid pressure alone. However, as addressed above, many of the embodiments disclosed in Fond do not require that the relief surface elements puncture or tear the tear face (see column 8, lines 32-39; column 9, lines 4-16; column 10, lines 11-16 and 37-41). Therefore, it is interpreted that the tear face tears by effect of the fluid overpressure alone. Since the cartridge of Fond functions in the same way as that of Applicant, it would have been expected that the cartridge of Fond would also result in a delay effect in the passage of the beverage through the second sheet after water has

been admitted into the cartridge, absent a showing to the contrary by clear and convincing evidence.

Conclusion

THIS ACTION IS MADE FINAL. Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire **THREE MONTHS** from the mailing date of this action. In the event a first reply is filed within **TWO MONTHS** of the mailing date of this final action and the advisory action is not mailed until after the end of the **THREE-MONTH** shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than **SIX MONTHS** from the mailing date of this final action.

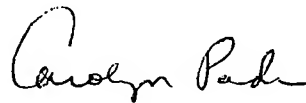
Any inquiry concerning this communication or earlier communications from the examiner should be directed to Sarah L. Kuhns whose telephone number is 571-272-1088. The examiner can normally be reached on Monday - Friday from 8:00 am - 4:30 pm.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Milton Cano can be reached at 571-272-1398. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

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Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

SLK



CAROLYN PADEN 1761
PRIMARY EXAMINER 4-1406

Notice of References Cited	Application/Control No. 10/728,342		Applicant(s)/Patent Under Reexamination YOAKIM ET AL.	
	Examiner Sarah L. Kuhns		Art Unit 1761	Page 1 of 1

U.S. PATENT DOCUMENTS

*		Document Number Country Code-Number-Kind Code	Date MM-YYYY	Name	Classification
*	A	US-4,136,202	01-1979	Favre, Eric	426/77
	B	US-			
	C	US-			
	D	US-			
	E	US-			
	F	US-			
	G	US-			
	H	US-			
	I	US-			
	J	US-			
	K	US-			
	L	US-			
	M	US-			

FOREIGN PATENT DOCUMENTS

*		Document Number Country Code-Number-Kind Code	Date MM-YYYY	Country	Name	Classification
	N					
	O					
	P					
	Q					
	R					
	S					
	T					

NON-PATENT DOCUMENTS

*		Include as applicable: Author, Title Date, Publisher, Edition or Volume, Pertinent Pages)
	U	
	V	
	W	
	X	

*A copy of this reference is not being furnished with this Office action. (See MPEP § 707.05(a).)
Dates in MM-YYYY format are publication dates. Classifications may be US or foreign.

EXHIBIT B



UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE
United States Patent and Trademark Office
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P.O. Box 1450
Alexandria, Virginia 22313-1450
www.uspto.gov

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/728,342	12/03/2003	Alfred Yoakim	88265-7072	8608
29157	7590	07/26/2006		
BELL, BOYD & LLOYD LLC P. O. BOX 1135 CHICAGO, IL 60690-1135				
			EXAMINER CORBIN, ARTHUR L	
			ART UNIT 1761	PAPER NUMBER

DATE MAILED: 07/26/2006

Please find below and/or attached an Office communication concerning this application or proceeding.

RECEIVED
BELL, BOYD & LLOYD
INTELLECTUAL PROPERTY DOCKET
JUL 31 2006
ATTY LEG-MYB
DOCKET # 112781 - 573

**Advisory Action
Before the Filing of an Appeal Brief**

Application No.

10/728,342

Applicant(s)

YOAKIM ET AL.

Examiner

Arthur L. Corbin

Art Unit

1761

--The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

THE REPLY FILED 18 July 2006 FAILS TO PLACE THIS APPLICATION IN CONDITION FOR ALLOWANCE.

1. ☒ The reply was filed after a final rejection, but prior to or on the same day as filing a Notice of Appeal. To avoid abandonment of this application, applicant must timely file one of the following replies: (1) an amendment, affidavit, or other evidence, which places the application in condition for allowance; (2) a Notice of Appeal (with appeal fee) in compliance with 37 CFR 41.31; or (3) a Request for Continued Examination (RCE) in compliance with 37 CFR 1.114. The reply must be filed within one of the following time periods:

- a) ☒ The period for reply expires 3 months from the mailing date of the final rejection.
b) ☐ The period for reply expires on: (1) the mailing date of this Advisory Action, or (2) the date set forth in the final rejection, whichever is later. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the mailing date of the final rejection.

Examiner Note: If box 1 is checked, check either box (a) or (b). ONLY CHECK BOX (b) WHEN THE FIRST REPLY WAS FILED WITHIN TWO MONTHS OF THE FINAL REJECTION. See MPEP 706.07(f).

Extensions of time may be obtained under 37 CFR 1.136(a). The date on which the petition under 37 CFR 1.136(a) and the appropriate extension fee have been filed is the date for purposes of determining the period of extension and the corresponding amount of the fee. The appropriate extension fee under 37 CFR 1.17(a) is calculated from: (1) the expiration date of the shortened statutory period for reply originally set in the final Office action; or (2) as set forth in (b) above, if checked. Any reply received by the Office later than three months after the mailing date of the final rejection, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

NOTICE OF APPEAL

2. ☐ The Notice of Appeal was filed on _____. A brief in compliance with 37 CFR 41.37 must be filed within two months of the date of filing the Notice of Appeal (37 CFR 41.37(a)), or any extension thereof (37 CFR 41.37(e)), to avoid dismissal of the appeal. Since a Notice of Appeal has been filed, any reply must be filed within the time period set forth in 37 CFR 41.37(a).

AMENDMENTS

3. ☒ The proposed amendment(s) filed after a final rejection, but prior to the date of filing a brief, will not be entered because
(a) ☒ They raise new issues that would require further consideration and/or search (see NOTE below);
(b) ☐ They raise the issue of new matter (see NOTE below);
(c) ☒ They are not deemed to place the application in better form for appeal by materially reducing or simplifying the issues for appeal; and/or
(d) ☐ They present additional claims without canceling a corresponding number of finally rejected claims.

NOTE: See Continuation Sheet. (See 37 CFR 1.116 and 41.33(a)).

4. ☐ The amendments are not in compliance with 37 CFR 1.121. See attached Notice of Non-Compliant Amendment (PTOL-324).
5. ☐ Applicant's reply has overcome the following rejection(s): _____.
6. ☐ Newly proposed or amended claim(s) _____ would be allowable if submitted in a separate, timely filed amendment canceling the non-allowable claim(s).
7. ☒ For purposes of appeal, the proposed amendment(s): a) ☒ will not be entered, or b) ☐ will be entered and an explanation of how the new or amended claims would be rejected is provided below or appended.
The status of the claim(s) is (or will be) as follows:
Claim(s) allowed: None.
Claim(s) objected to: None.
Claim(s) rejected: 1,2,4,5,10-12,14-16,19 and 20.
Claim(s) withdrawn from consideration: None.

AFFIDAVIT OR OTHER EVIDENCE

8. ☒ The affidavit or other evidence filed after a final action, but before or on the date of filing a Notice of Appeal will not be entered because applicant failed to provide a showing of good and sufficient reasons why the affidavit or other evidence is necessary and was not earlier presented. See 37 CFR 1.116(e).
9. ☐ The affidavit or other evidence filed after the date of filing a Notice of Appeal, but prior to the date of filing a brief, will not be entered because the affidavit or other evidence failed to overcome all rejections under appeal and/or appellant fails to provide a showing a good and sufficient reasons why it is necessary and was not earlier presented. See 37 CFR 41.33(d)(1).
10. ☐ The affidavit or other evidence is entered. An explanation of the status of the claims after entry is below or attached.

REQUEST FOR RECONSIDERATION/OTHER

11. ☐ The request for reconsideration has been considered but does NOT place the application in condition for allowance because: _____.
12. ☐ Note the attached Information Disclosure Statement(s). (PTO/SB/08 or PTO-1449) Paper No(s).
13. ☐ Other: _____.

Arthur L. Corbin
Primary Examiner
Art Unit: 1761

7-20-06

Continuation of 3. NOTE: New issues are raised in claim 1 by reciting that the second sheet is "air permeable" (line 9) and by cancelling "prescored plastic material" from the Markush group in lines 8 & 10.

EXHIBIT C



US005897899A

United States Patent [19]

Fond

[11] Patent Number: 5,897,899**[45] Date of Patent: Apr. 27, 1999****[54] CARTRIDGES CONTAINING SUBSTANCES FOR BEVERAGE PREPARATION****[75] Inventor: Olivier Fond, Kobe, Japan****[73] Assignee: Nestec S.A., Vevey, Switzerland****[21] Appl. No.: 08/203,891****[22] Filed: Feb. 28, 1994****Related U.S. Application Data****[63]** Continuation-in-part of application No. 07/869,526, Apr. 16, 1992, abandoned, and application No. 07/880,173, May 6, 1992, Pat. No. 5,402,707.**[30] Foreign Application Priority Data**

May 8, 1991	[EP]	European Pat. Off.	91107462
May 10, 1991	[EP]	European Pat. Off.	91107650
Jul. 8, 1991	[EP]	European Pat. Off.	91111317
Jan. 28, 1992	[EP]	European Pat. Off.	92101389

[51] Int. Cl.⁶ A23F 5/26**[52] U.S. Cl. 426/112; 426/77; 99/295****[58] Field of Search 426/77, 79, 84, 426/433, 112; 99/295****[56] References Cited****U.S. PATENT DOCUMENTS**

2,451,195	10/1948	Brown .
2,778,739	1/1957	Rodth .
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2,936,695	5/1960	Donot .
3,292,527	12/1966	Stasse .
3,403,617	10/1968	Lampe .
3,589,272	6/1971	Bouladon .

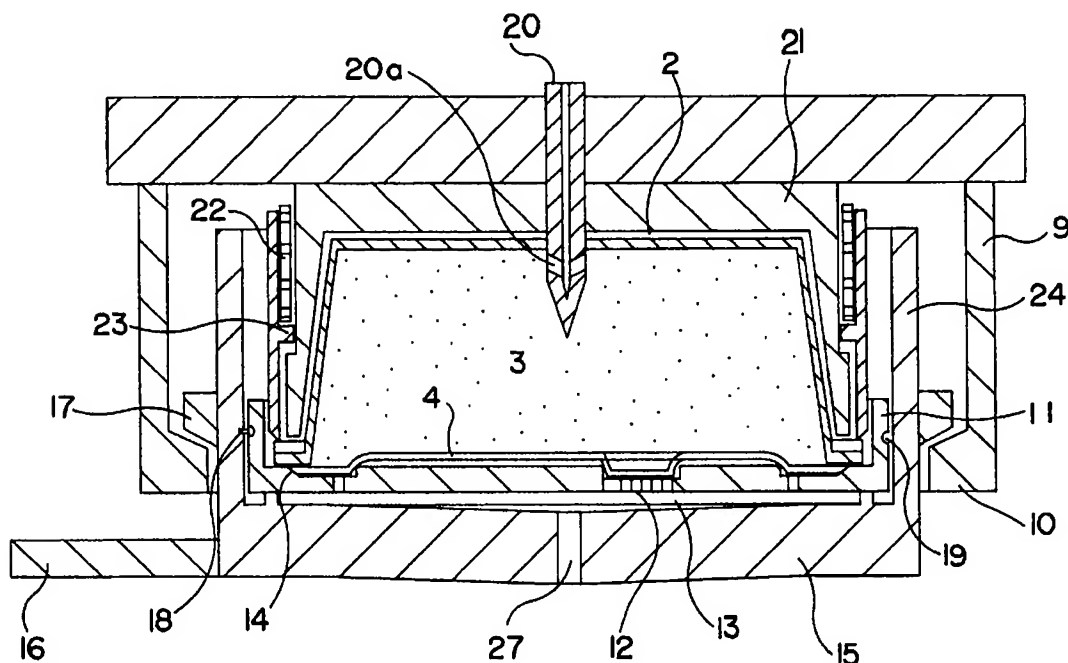
3,607,297	9/1971	Fasano .
3,812,273	5/1974	Schmidt .
3,823,656	7/1974	Vander Veken .
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4,853,234	8/1989	Bentley et al. .
5,008,013	4/1991	Favre et al. .

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7430109	3/1976	Germany .
314618	2/1934	Italy .
605293	9/1978	Switzerland .
938617	10/1963	United Kingdom .
2255494	11/1992	United Kingdom .

Primary Examiner—Steven Weinstein**Attorney, Agent, or Firm—Vogt & O'Donnell, LLP****[57] ABSTRACT**

A sealed cartridge, which need have no marks for weakening and inside which, no filter is needed, contains a substance, such as roasted and ground coffee, for being extracted under pressure. The cartridge has a cup having a base and a lateral wall extending from the base to a lip which extends laterally away from the wall about a cup opening, and the cartridge has a cover sealed to the lip to cover the opening. Either the cover or the base provides a tear face which is torn under stress during extraction of the substance under pressure for preparation of a beverage.

10 Claims, 8 Drawing Sheets

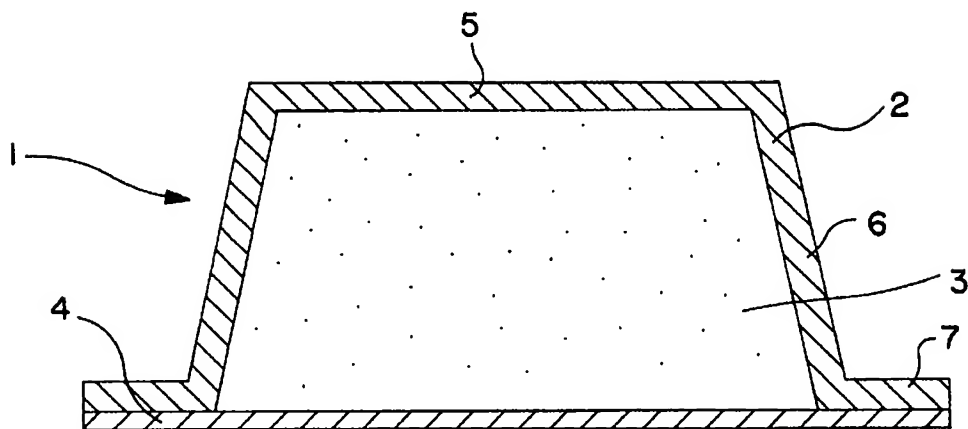


FIG. 1

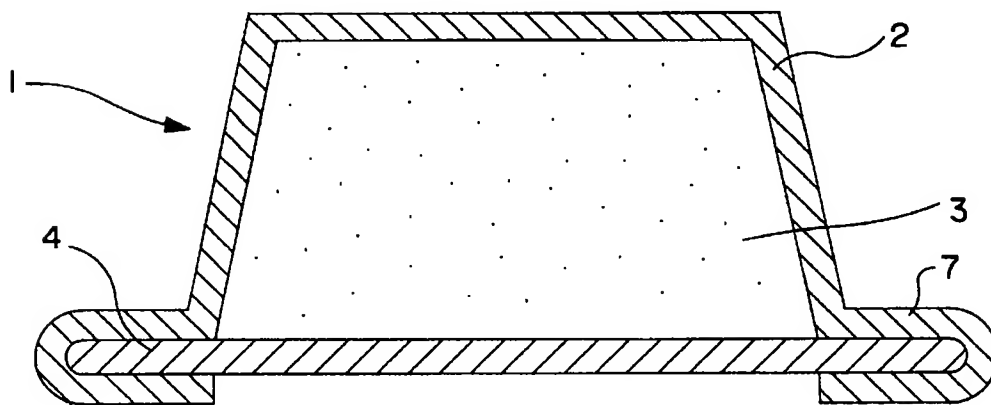


FIG. 2

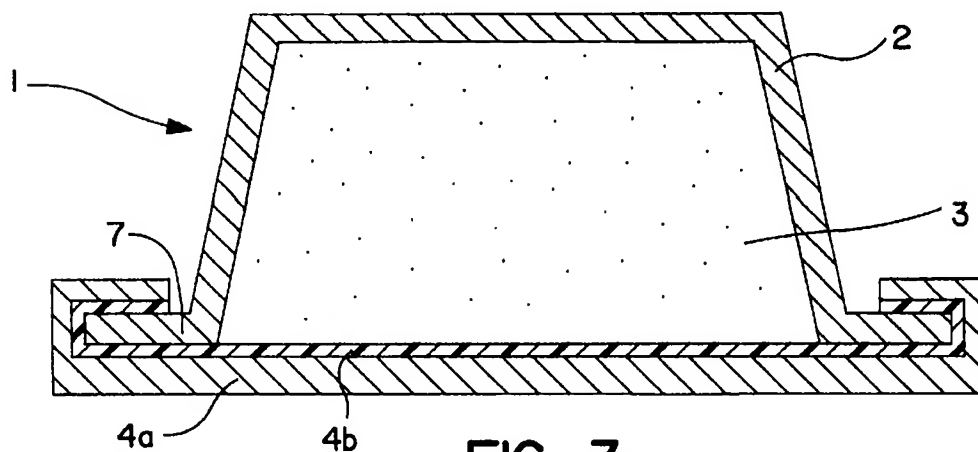


FIG. 3

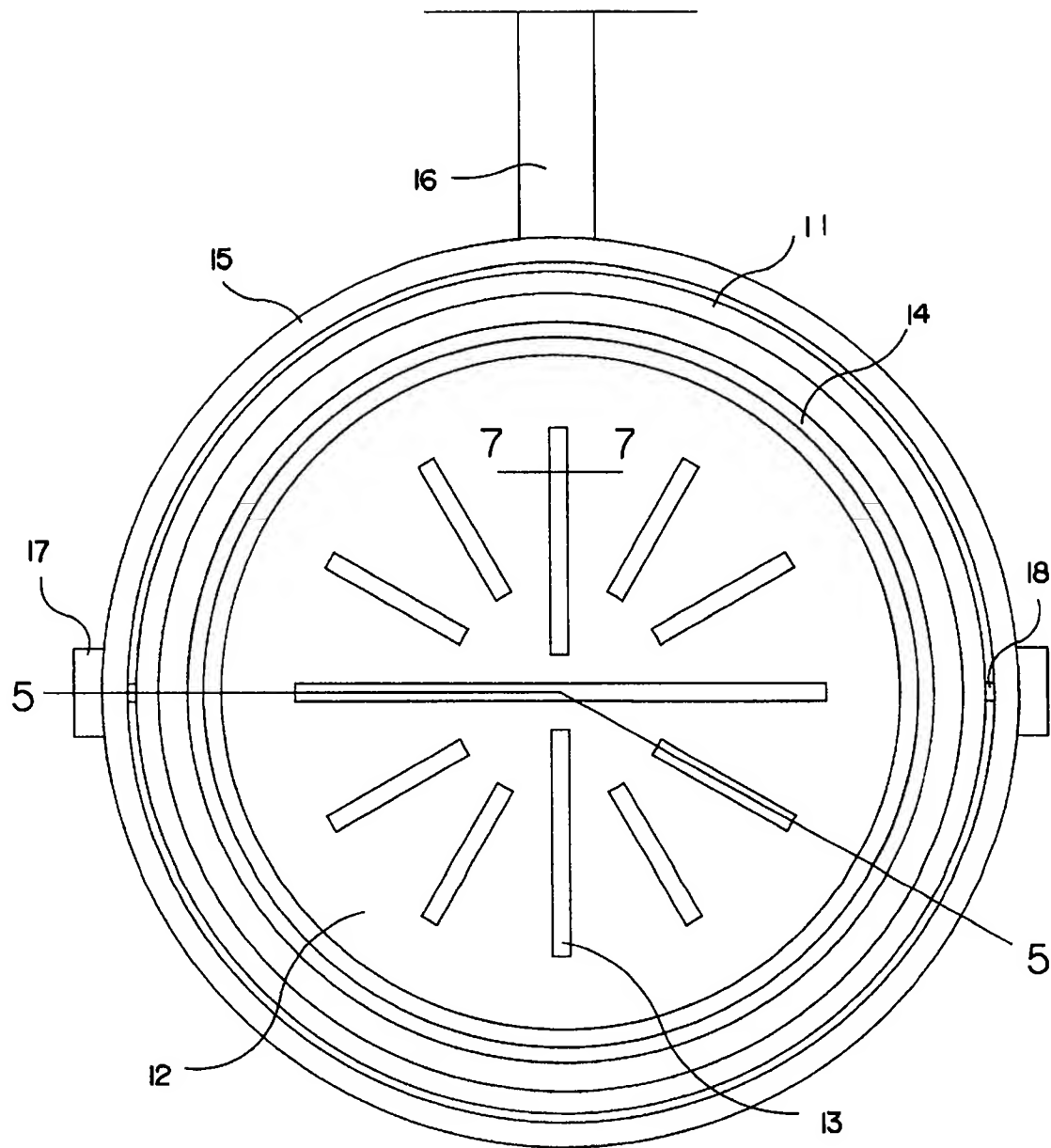


FIG. 4

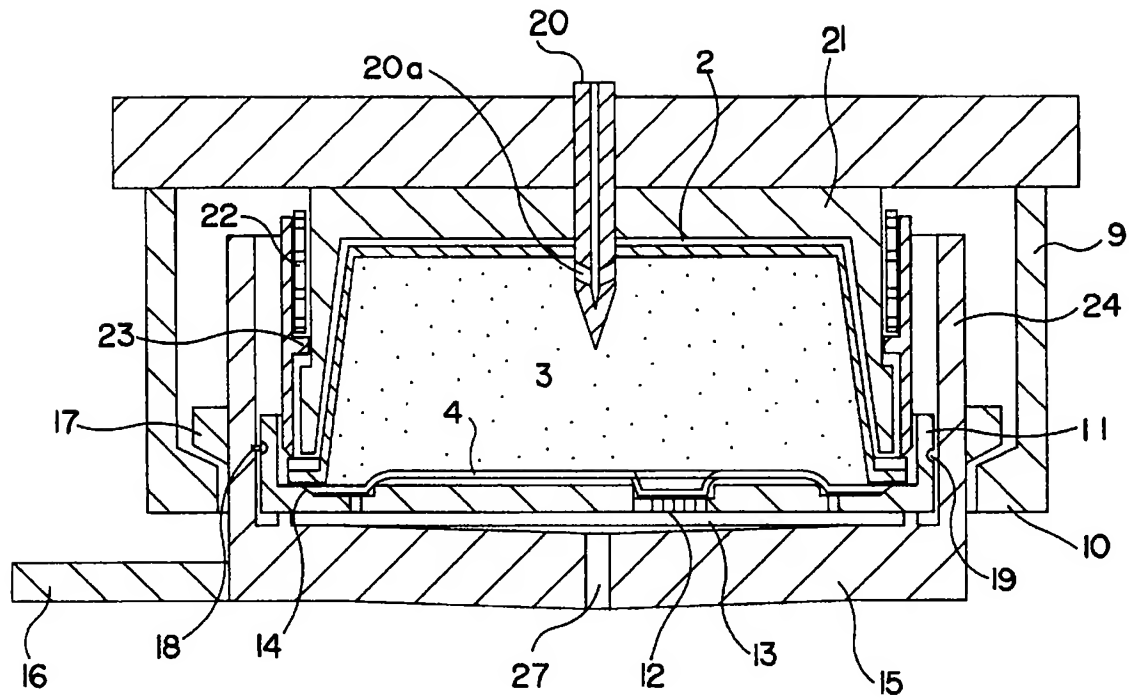


FIG. 5

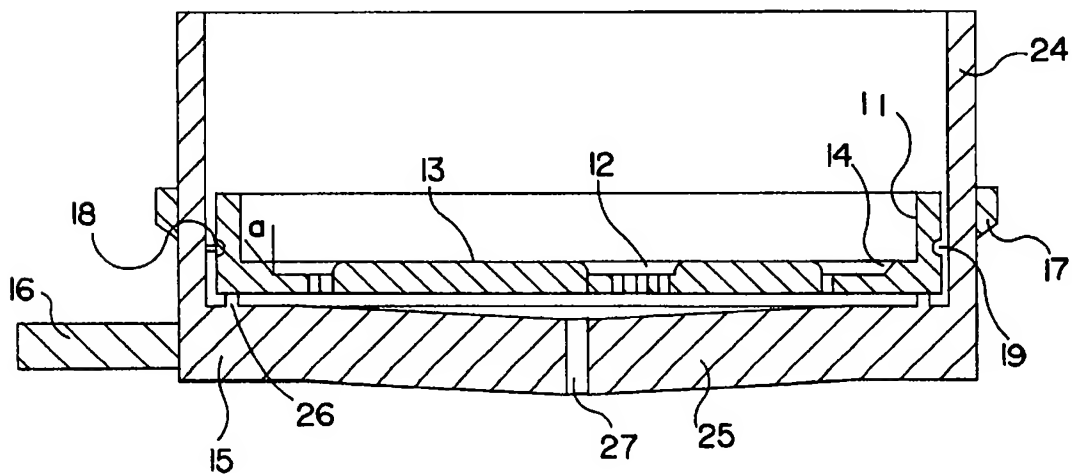


FIG. 6

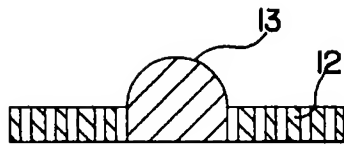


FIG. 7a

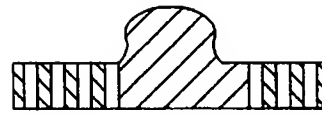


FIG. 7b

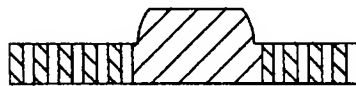


FIG. 7c



FIG. 7d

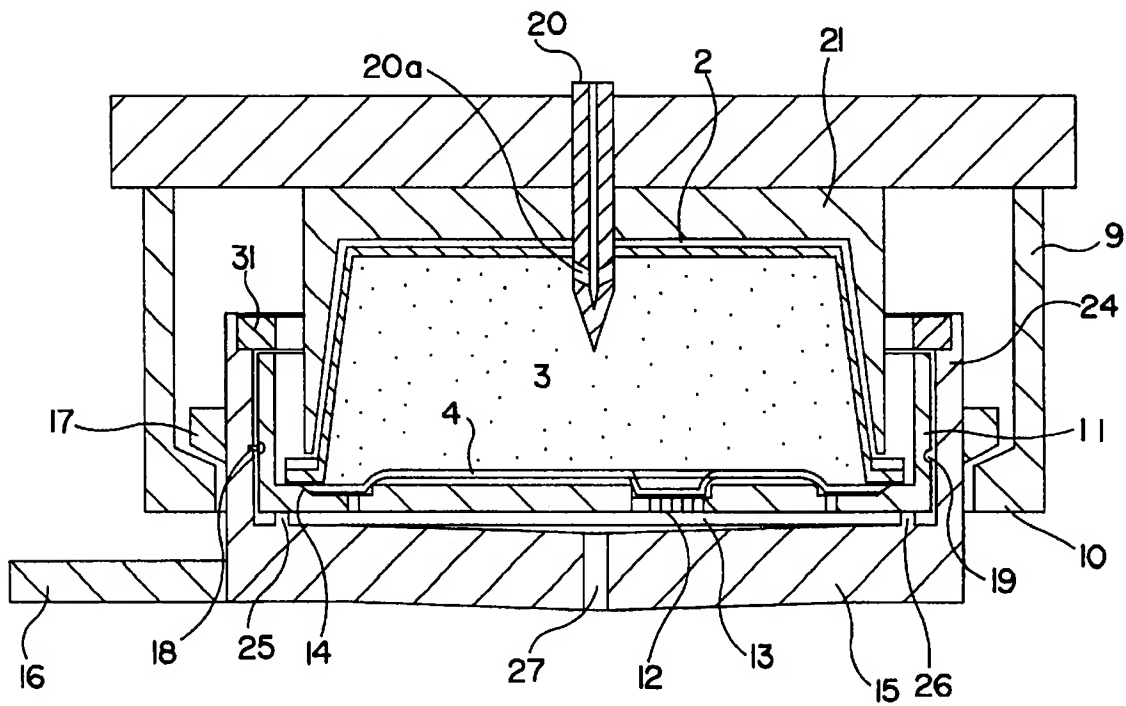


FIG. 8

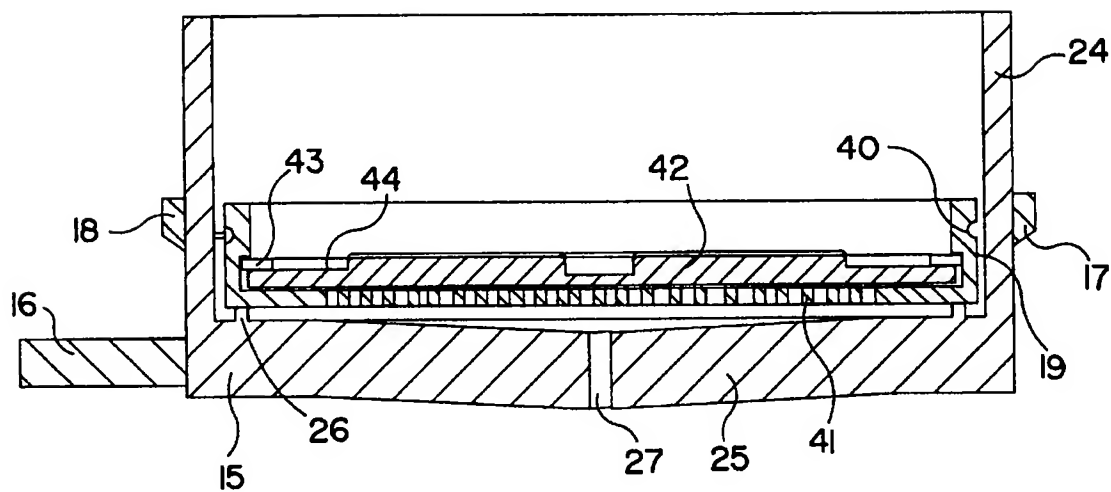


FIG. 9

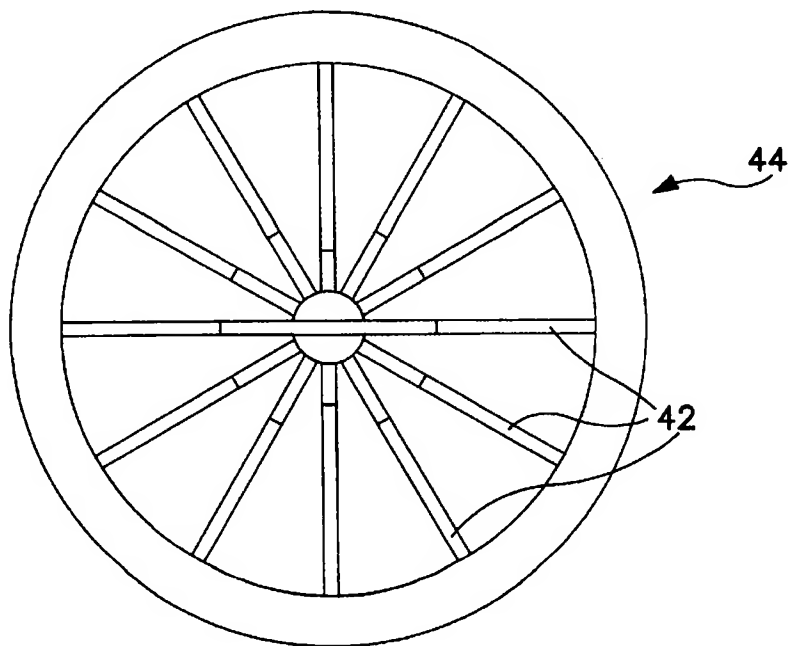


FIG. 10

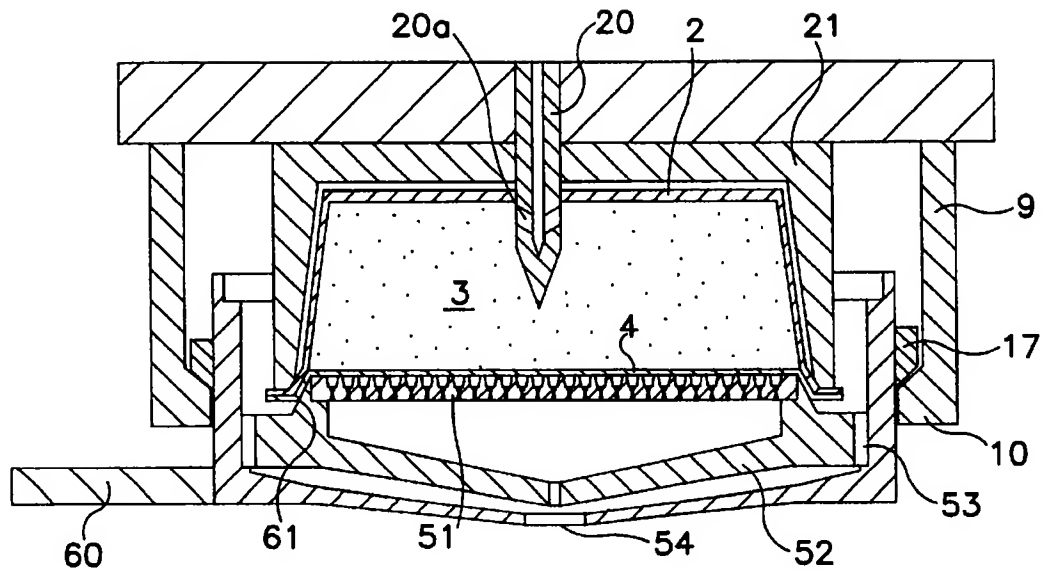


FIG. 11

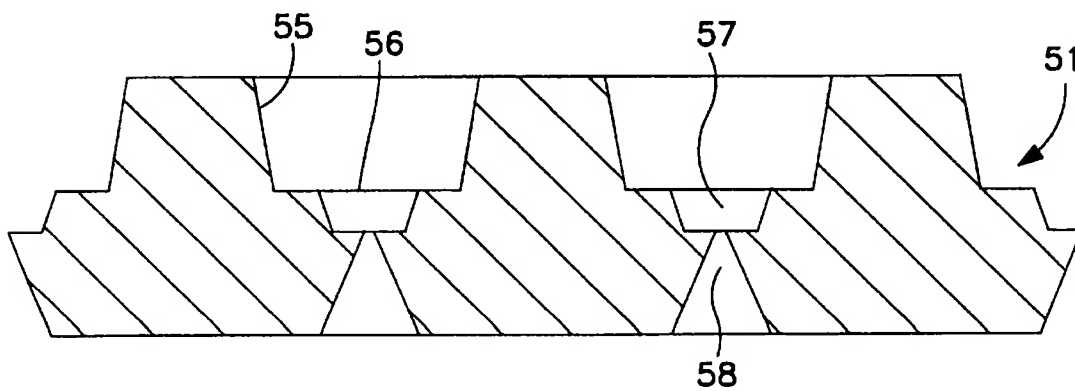


FIG. 12

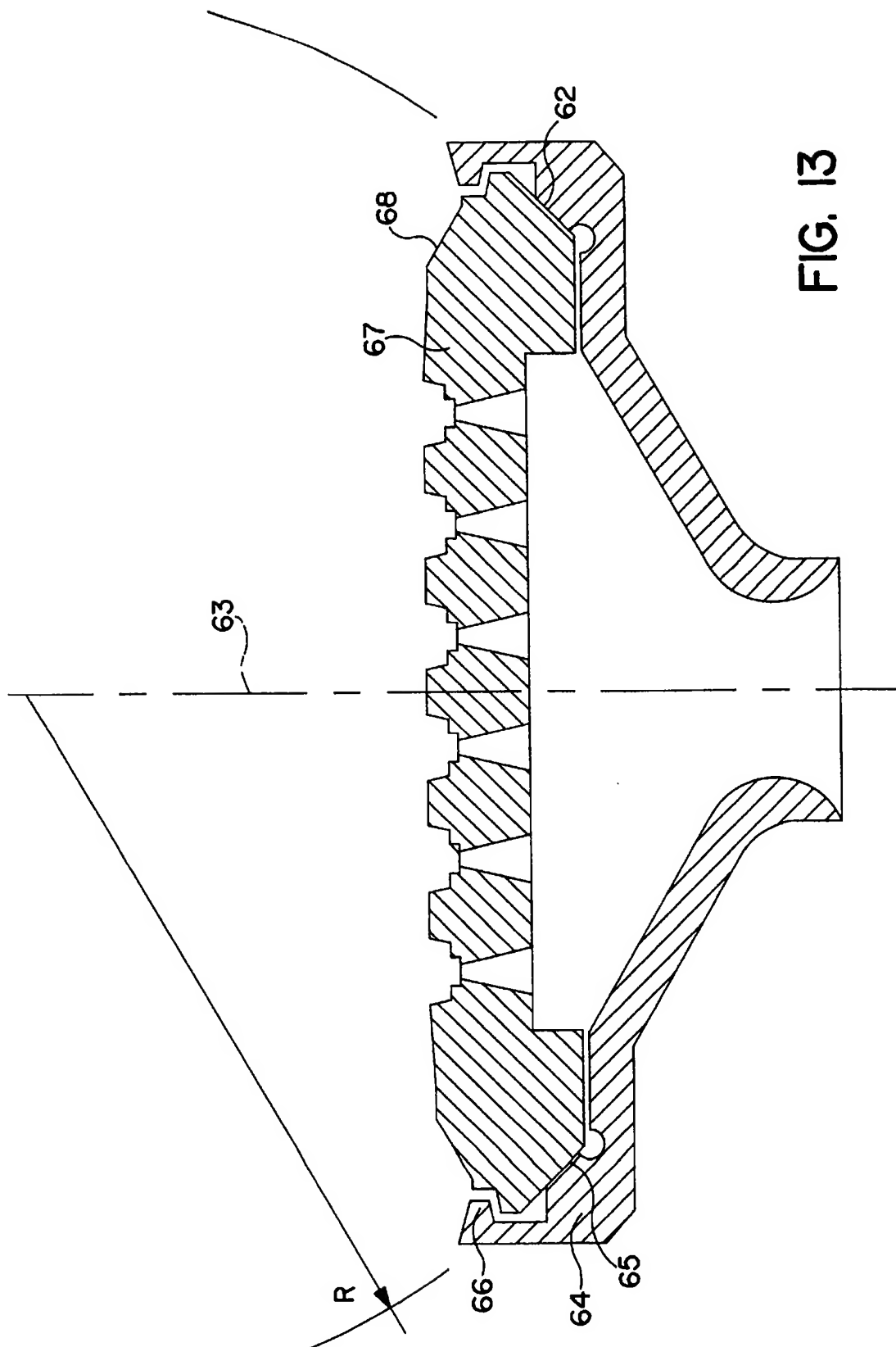


FIG. 13

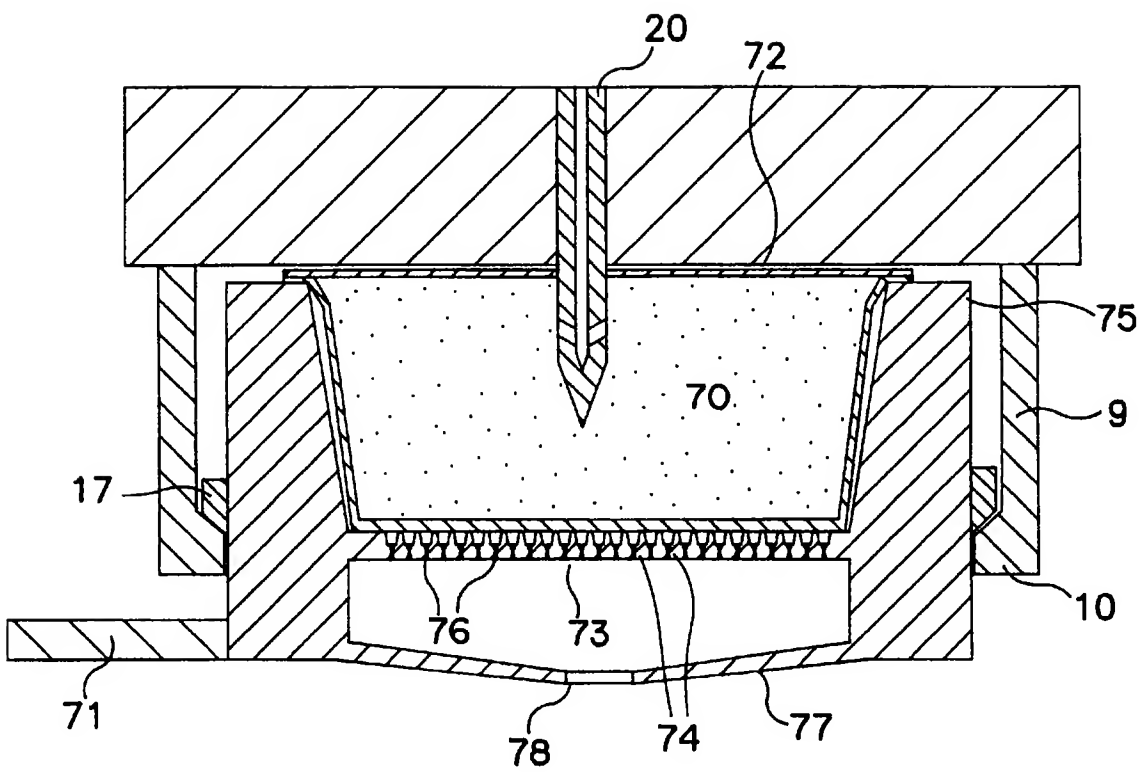


FIG. 14

CARTRIDGES CONTAINING SUBSTANCES FOR BEVERAGE PREPARATION

CROSS-REFERENCE TO RELATED APPLICATIONS

This is a continuation-in-part application of application Ser. No. 07/869,526, filed Apr. 16, 1992, now abandoned and of application Ser. No. 07/880,173, filed May 6, 1992, now U.S. Pat. No. 5,402,707.

BACKGROUND OF THE INVENTION

This invention relates to preparation of a comestible beverage from a substance contained in a cartridge and to cartridges containing a substance for preparation of a beverage.

There are several reasons for employing cartridges to contain substances for preparation of aqueous fluid comestibles, particularly beverages, which include considerations of hygiene, optimal storage and keeping qualities of the material employed to produce the fluid comestibles and which include control of the quality and reproducibility of the fluid comestibles prepared. Among available cartridges, including those which have found particular applicability for providing single servings of espresso coffees, cartridges which are sealed and which are opened under the effect of water injected under pressure satisfy the requirements mentioned above. In general, cartridges which contain substances for the preparation of fluid comestibles may be differentiated by their opening systems and ease of use and cost of manufacture.

Great Britain Patent Specification 938,617 discloses a sealed cartridge which has an internally disposed filter positioned to form two compartments in the cartridge. The cartridge is employed for preparation of a beverage by positioning it in an infusion apparatus system which provides for piercing opposing cartridge faces. That system, however, has piercing elements exposed which could be injurious and does not ensure cleanness during extraction or easy release of the cartridge and any material contained therein on completion of extraction.

Swiss Patent 605 293 and its counterpart U.S. Pat. No. 4,136,202, disclose a cartridge which, by design, has a weakened wall formed by marks for forming a line of weakening to effect preferential tearing under the effect of pressure introduced into the cartridge. This feature, however, has a disadvantage of increasing the complexity, and hence the cost, of the cartridge because the materials used have to be fabricated very precisely if opening of the cartridge is to be correct and reproducible. In addition, unless the cartridge contains a completely soluble substance, the cartridge contains a filter which is strong enough to retain a substance, such as coffee grounds, therein during an extraction process, which itself tends to be costly.

As described by Fasano in U.S. Pat. No. 3,607,279, French Patent No. 1,537,031 and French Patent Application Publication No. 2,033,190, a first foil strip of aluminum or plastic or other air-impervious material is formed to provide a plurality of cup body pockets in the strip for containing a material for preparation of a beverage, and a second strip provides a cover for the cup pockets opposite the cup base face. To obtain a beverage, this cartridge is employed with an apparatus embodied to provide elements which pierce both the cover face and cup body base face, to provide for introduction of a liquid and release of a beverage, or which pierce only the cover for introduction of extraction fluid, in which case, liquid introduced into the cartridge is relied

upon to assist opening the cup body base face to provide for release of the beverage. The apparatus system however, is difficult to manufacture and the process is difficult to carry out because of the perforated plate and spring arrangement employed for engaging the base face of the cartridge, which makes the process operations delicate and difficult to control.

As described, in particular, in the Fasano U.S. disclosure, the cartridge contains at least one filter therein except when the beverage preparation material is a liquid, and it is disclosed that it is possible to eliminate a sheet of filter material by making the pierced holes so small that they themselves serve as a filter. In the case when only the cover is pierced, it is stated that it is possible to weaken the cup base face at spaced locations or to make an entire region of the cup base face weaker than the cover face to carry out the base opening. It is stated that opening of the base is possible by replacing piercing teeth with configurations which leave marks which first weaken the cup body base material so that the body base is weakened to make it more readily penetrable under the pressure of the liquid than if the cup base face were left intact. Thus, in a first phase, weakened areas are created by mechanical action upon the face, after which, in a second phase, the effect of pressure of water introduced in the cartridge results in rupturing the face at the weakened zones. It also is disclosed that the cup body base may be weakened relative to the cover by using a thinner or otherwise inherently weaker material for the cup body, it being disclosed that the pressure at which the base face will rupture to some extent being varied by changing the thickness or compactness of the filter material above the base face.

As the Fasano disclosure teaches, the liquid introduced to prepare the beverage moves by gravity, and it is believed that, when proceeding in accordance with the process and apparatus system of the Fasano disclosures, the tearing of the face of the cartridge will not necessarily be sufficient to guarantee a regular flow of a liquid therethrough, and that the maximum pressure in the cartridge is reached during opening of the cartridge. The subsequent pressure in the cartridge, therefore, is at most equal to the pressure which effects the opening and that is fairly restrictive in terms of use for, in particular, obtaining single serving amounts from substances which require extraction in a short period of time with small amounts of water. Thus, the substances are not extracted sufficiently to achieve a desirable and/or efficient extraction, particularly in the case of such as preparation of an espresso coffee.

Accordingly, problems addressed by the present invention include how to obtain a high quality uniformly reproducible fluid comestible product from an economical carrying package and how to do so in a system which remains clean and which is easy to maintain, while utilizing the advantages of employing cartridges to contain substances for the preparation of fluid comestibles, including beverages.

SUMMARY OF THE INVENTION

In the present invention, sealed cartridges are containers in which wall surfaces, including a face surface which is opened during preparation of a fluid comestible for release of a beverage or other comestible from the cartridge, i.e., "the tear face", are formed and connected sufficiently to contain a substance before and during an extraction process. Most advantageously, the cartridges of the invention need not have filters incorporated therein, particularly filters which can withstand elevated pressure and remain intact to

secure the substance in the cartridge, and the cartridge need not contain marks for weakening, including marks for forming a line or lines of weakening, a wall surface tear face for opening the cartridge for release of a beverage, although cartridges having filters and marks for weakening a wall face are not precluded from use in the process or apparatus devices disclosed below. The cartridge of the present invention is easy and inexpensive to manufacture and may be used particularly for the preparation of espresso coffee which is prepared by extracting roast and ground coffee under pressure.

The present invention provides a sealed cartridge which has a lipped cup, which may be frustoconical, frustopyramidal, or hemispherical in shape, and which has a cover for covering the cup opening. The base of the cup may be, but need not be, flat and thus may assume the above-mentioned or other geometries, and the sealed cartridge may take the shapes disclosed in Swiss Patent 605 293 and U.S. Pat. No. 4,136,202, the disclosure of such being herein incorporated by reference.

In the present invention, the cover or the base of the cup is intended to tear under stress from the effect of pressure of an extraction fluid during an extraction process, the tearable portion having a flexible character as may be provided by a metal foil, or a plastic film or a metal/plastic composite, or a metal and/or plastic and paper fiber composite. The tear face preferably is provided by aluminum. In particularly advantageous embodiments, the cup is at least semi-rigid, in that it has a strength sufficient to enable resisting deformation during normal handling and storage.

The present invention provides, in particular, a sealed cartridge which comprises a cup and a cup cover and a substance for preparation of a beverage contained therein, wherein the cup has a base and a sidewall extending from the base to a lip which extends laterally away from the sidewall about a cup opening and wherein the cover covers the opening and is sealed to the lip, there being no marks in the cover for weakening the cover, or the base, and no filter positioned within the cartridge.

A sealed cartridge embodiment of the present invention is characterized further in that the cover has a thickness less than a thickness of any of the cup base, sidewall and lip. In this embodiment, it is the cover which is intended to be torn under stress, and the cup is advantageously at least semi-rigid.

Further embodiments are characterized in that the sidewall is substantially frustoconical in shape and in that in the frustoconical embodiment, the diameter of the opening is greater than a diameter of the base.

The cartridge of the present invention is particularly useful for containing a substance which requires extraction for preparation of a beverage and the present invention is characterized particularly in that the substance contained in the cartridge is roast and ground coffee. In a particularly advantageous embodiment, the roast and ground coffee is a coffee suitable for preparation of an espresso coffee, which as is known in the art is a coffee which has a dark roast and a fine grind. Substances including roast and ground coffee for preparing cappuccino beverages also are desirable.

Additionally, when a substance sensitive to oxidation is contained in the cartridge, such as roast and ground coffee, the elements of the cartridge are desirably substantially impervious to oxygen, such as may be provided by metal and plastic materials including such as aluminum, aluminum/plastic composites, aluminum/plastic/paper composites, substantially oxygen-impermeable plastics and multilayer plastics.

Beverage preparation, including substance extraction, may be effected by a process which is characterized in that the sealed cartridge containing at least one substance for enabling preparation of a fluid comestible product, particularly a beverage, is placed in a cartridge holder means having a base which comprises a flow grille and a relief surface element adjacent a face of the cartridge to be opened for release of the fluid comestible, after which water is introduced into the cartridge under a pressure greater than atmospheric pressure for preparing the fluid comestible from the substance and to press the face of the cartridge against the relief surface element to tear the cartridge face to enable the fluid comestible to be removed from the cartridge and pass through the relief surface element and flow grille for collection. Preferably, the water, optionally mixed with a gas such as air, is introduced into the cartridge under a pressure of from above 1 bar to about 20 bar.

The flow grille, by definition, provides and comprises a grating having orifices therethrough. The relief surface element comprises a plurality of members which define and delineate openings through which the fluid comestible may pass and may be formed with the flow grille in one integrated piece or may be a distinctly separate element, the relief surface element in all cases being positioned to form an interface between the flow grille matrix and a cartridge surface face to be opened for preparing and obtaining the fluid comestible.

In the extraction process, depending upon the configuration and arrangement of the relief surface element, when the face of the cartridge positioned adjacent the relief surface element is pressurized and reaches its breaking stress, it is torn at locations of members of the relief surface element, which may project from the relief surface element, and/or at recesses formed by the relief surface element, such as with respect to recess parts formed together with projecting members, and/or at openings between projecting members and/or recesses.

The extraction process is characterized by enabling employment of a high pressure which provides for efficient preparation of fluid comestibles, because a maximum pressure is not necessarily reached during opening of the cartridge and may be reached after opening during extraction.

DETAILED DESCRIPTION OF THE INVENTION

The following description is set forth by way of example, primarily with regard to a cartridge containing roast and ground coffee. This description, however, should not be construed to limit the invention in any way, since the cartridge of the invention is suitable for containing a variety of products or mixtures of products which are suitable for preparation of fluid comestibles by addition of water, including but not limited to tea, soluble tea or coffee, a mixture of ground coffee and soluble coffee, cocoa, or a cocoa- or chocolate-based or -supplemented product including coffee, or a soup, or a dehydrated edible substance, or for preparing other foods such as in a form of infusions, for example.

A cartridge of the present invention which contains a substance to be prepared into a fluid comestible is advantageously employed with and supported by a cartridge holder means having a base which comprises a flow grille and a relief surface element adjacent a face of the cartridge to enable tearing of the face under pressure during introduction of water, or optionally water and a gas such as air, to enable preparation of the fluid comestible.

The cartridge holder means may be embodied in a variety of shapes to accommodate a variety of shapes of cartridges

including, but not limited to, frustoconical cartridges, hemispherical cartridges and inverted frustoconical cartridges, the criterion of holder shape being that at least an interior holding or support portion be shaped to substantially correspond to an outer shape of the cartridge to be held or supported for enabling preparation of a fluid comestible.

In addition, an extraction apparatus system for preparing a beverage from a material contained in the cartridge will include, in addition to a cartridge holder means and base, a cartridge holder support means and a means for introducing water, or optionally water and a gas such as air, under pressure into the cartridge, by such as an injection means, under fluid-tight conditions.

The support means may be positioned with respect to the water injection means by fixing means and include an annular element which has an internal recess which has a shape which substantially conforms to an outer shape of a cartridge to be extracted and which cooperates with a periphery of the cartridge holder means to keep the cartridge in position and to ensure fluid-tightness between the cartridge and apparatus with respect to a surface about the water injector means during fluid comestible preparation.

Although various shapes of cartridges may be adopted for the convenience of production processes or for a particular application, the sealed cartridge of the present invention employed in the process and with apparatus described herein, preferably, has a sidewall at least substantially frustoconical in shape. When roast and ground coffee is the substance in the cartridge, the cartridge may have a diameter of from about 25 mm to about 60 mm and have a height of from about 10 mm to about 30 mm, and the dimensions may vary with the volume and/or amount of coffee substance to be extracted, which may vary such as from 5 g to 20 g which, and a cartridge within the scope of the above dimensions, may provide a coffee layer thickness of from about 10 mm to about 25 mm.

As will be appreciated, materials employed for forming the tear face should be such that, when impinged upon the relief surface element the tear faces, in accordance with the invention, is embodied to withstand a pressure in the interior of the cartridge above 1 bar, and particularly such as a pressure within the range of from 2 bar to 15 bar, prior to breaking and tearing, such providing for the phases of extraction discussed further below. Thicknesses of the tear face materials which, as will be appreciated, may be dependent upon their barrier properties and breaking stress, may range from about 5 μm to about 100 μm , for example.

The materials employed for the tear face should have a character of a foil, which may be provided such as with a metal such as aluminum, or of a plastic film which, preferably in the case of roast and ground coffee, is substantially impermeable to oxygen, such films being known to those skilled in the art. Composite materials may be employed, and such include, but are not limited to, for example metal/plastic, metal/plastic/paper, plastic/plastic. Plastics may include, but are not limited to, polyethylene, polypropylene, PET (polyethylene terephthalate), and acrylics and the like.

Of the foregoing materials, aluminum is preferred since tears most easily and cleanly. On the other hand, when a multilayer tear face is employed, the presence of paper fibers, which may include such as a filter paper, and/or a stretched plastic film material, including fibers, enables a network to be formed at the location of the tears which is favorable for keeping the face integrally intact and reducing the dispersion of the coffee grounds to facilitate homoge-

neous extraction of the layer of coffee and for preventing coffee grounds from being dispersed from the cartridge, such as onto the flow grille.

The tear face, particularly when it is the cover, may be made of aluminum having a thickness of from about 5 μm to less than 60 μm , and particularly up to but less than 50 μm , and from about 20 μm to about 45 μm and particularly to about 40 μm , and advantageously, from about 25 μm to about 35 μm .

A multilayer cover may be made of either 20 g/m² to 60 g/m² paper fibers, plastic, such as 20 μm to 60 μm thick polyethylene, and 5 μm to 20 μm thick aluminum or EVOH (ethylene and vinyl alcohol copolymer) or PVDC (polyvinylidene chloride) 5 μm to 30 μm thick and plastic, such as polypropylene, polyethylene or polyamide, 20 μm to 100 μm thick or PET 5 μm to 30 μm thick and plastic 20 μm to 100 μm thick or metallized PET or PET provided with an upper barrier layer, such as SiO₂. A multilayer combination of paper fibers and aluminum may also be used, as well as a multilayer cover which has a layer based on paper fibers, which may include a filter paper, or woven, or non-woven fibers based on PET or polypropylene which may have a density of 20 g/m² to 50 g/m².

The cup advantageously may be made of aluminum having a thickness of at least greater than 20 μm , and particularly from at least greater than 50 μm . Thickness up to less than 60 μm may enable the base to be employed as the tear face, and thicknesses greater than 50 μm and up to 150 μm provide a cup which approaches being and which is at least semi-rigid.

When the cup is semi-rigid and the cover provides the tear face, the cup has a thickness of at least 60 μm , and preferably, the semi-rigid cup has a thickness particularly in the range of from about 80 μm to 120 μm and in particular, from about 90 μm to 110 μm . Also, pure plastic or a multilayer plastic, optionally with an oxygen barrier layer, such as EVOH and PVDC, a multilayer film, such as cardboard/aluminum/plastic or cardboard/plastic optionally with an oxygen barrier layer, such as EVOH or PVDC, may be employed and have like thickness.

The cover may be sealed to the lip of the cup by heat-seal welding, with such as with a welding lacquer/adhesive on opposite faces of the parts to be sealed. The cover and lip also may be crimped and/or sealed and crimped. In one embodiment, the cup lip is folded over and crimped to the cover. In another embodiment, the cover is folded over and crimped to the lip.

Use of the cartridge embodiment of the present invention for preparation of a beverage may be characterized by successive phases which, such as in the particular case of preparing espresso coffee, may be carried out in known commercially available espresso machines comprising means for injecting water, or as above, optionally water mixed with a gas such as air, under pressure, and comprising cartridge holding means for holding a cartridge in position for extraction, and having the aforescribed grille and relief surface element and being adapted to the extent necessary for being secured for operation in the machines.

In a first phase, a cartridge containing a substance to be extracted for preparation of a beverage is placed in the cartridge holder means adjacent the holder base of the present invention, designed and adapted for being secured in the machine, so that a face of the cartridge, i.e., the tear face, is positioned adjacent the relief surface element and flow grille, without, preferably, any more or less deep impressions or similar deformations being formed in the tear face of the cartridge by members of the relief surface element.

In a second phase, the cartridge holder means containing the cartridge is introduced into the machine.

In a third phase, water, optionally mixed with air, is injected into the cartridge under a pressure of from above 1 bar to about 20 bar, and preferably from above 1 bar to about 10 bar, which thereby deforms and presses the tear face against the members of the relief surface element. In addition, this phase provides for prewetting and compaction of the coffee particles.

In a fourth phase, the material of the tear face impinges upon the relief surface element members and reaches its breaking stress, tearing begins in zones at the location of the relief surface element members, which may project, and/or in the recessed parts, i.e., in cavities or depressions formed in the members, and/or at flow openings between and defined by the members of the relief surface element. Depending on the configuration, arrangement, shape and size of the relief surface element members, tearing can also continue throughout the process, the relief element surface members, however, being configured, arranged, sized and/or shaped not only to enable formation of openings in the tear face but also to restrict and inhibit escape of the particulate, or solid phase, substance, which is being processed, from the interior of the cartridge via the openings formed in the tear face.

Upon tearing, the tear face is relieved of stress, and fractured parts of the face become pressed against the relief surface element which has the effect of enlarging the initial openings formed, thus promoting subsequent flow of the fluid, but again, in such a way which substantially restrict and inhibit solid phase substance from escaping or being dispersed outside the cartridge. Thus, the openings in the tear face formed with the aid of the relief surface element are of a size which substantially restricts and inhibits solid phase substance from escaping from the cartridges via openings in the tear face. Hence, the relief surface is configured, arranged, sized and shaped to effect this result.

Upon opening of the tear face, the pressure inside the cartridge undergoes a partial and momentary fall, but this momentary decompression is limited because the flow of fluid escaping from the cartridge is restricted both by the interstices formed by lips of the torn material of the tear face bearing against the relief surface element and by resistance provided by the flow orifices formed in the relief surface element and grille-work. Flow also is controlled, particularly in cases where a substance is extracted, by compaction of the extractable substance. Flow is thus controlled, and above all, displacement of solid phase substance from the contents of the cartridge, which could obstruct flow orifices and subsequently interfere with the uniformity and reproducibility of an extraction process, or which could unpleasantly affect a beverage or other fluid comestible product, is substantially restricted and inhibited.

In a fifth phase, the roast and ground coffee in the cartridge, is extracted under a pressure of from about 1 bar to about 20 bar, this pressure being intentionally and essentially linked to the loss of pressure through the wetted and compacted coffee. Further openings of the tear face can result in this phase when the pressure reaches high values, but again, in accordance with the most advantageous practice of the inventions, such should be of a size which substantially restricts and inhibits escape or displacement of solid phase substance from the cartridge.

In a final phase, the cartridge holder is released from the machine, and the cartridge, which may be released from the holder by an auxiliary means described hereinafter, may be removed by simple inversion of the cartridge holder.

After release from the cartridge holder, it will be found that the cartridge and its opened tear face retain their integrity, and amounts of solid phase substance from the cartridge attached to the holder, relief surface element and flow grille are minimal, if detectable.

The flow grille preferably may be embodied by a metal plate, such as aluminum or stainless steel, for example, although it may also be made of ceramic, plastic or any other equivalent and/or suitable material. Its shape and, generally, disk-like diameter, are dependent on that of the extraction face of a cartridge to be extracted. Thus, the grille should have a surface having a size and shape substantially similar with that of a tear face of a cartridge to be processed. Generally, the grille surface size may vary in diameter from about 20 mm to about 60 mm. Its thickness may be usually from about 0.5 mm to about 5 mm, depending on the material used and its strength.

The grille grid and matrix defines a plurality of orifices which preferably are of a size which, if solid phase substance should escape the cartridge, act to substantially restrict and inhibit the solid phase from passing with fluid. The orifices are optionally circular, and in such cases, may have a mean diameter of from about 0.2 mm to about 0.5 mm. The orifices also are preferably conical in shape, generally widening downwards. Differing shapes should have equivalently similar sizings.

In the present invention, the relief surface element may have various configurations and arrangements of members, and those members may have various shapes, as noted above and as further discussed below and also illustrated in the drawing Figures. The relief surface element may have members which may project away from a basic planar surface of the element and which may or may not enable directly cutting or perforating the tear face, and in accordance with the invention, the tearing action on the tear face of the cartridge is made only possible because the relief surface element enables the tear face to reach its breaking stress during deformation under pressure. In any event, the relief surface element is configured and arranged to provide zones for substantially homogeneous distribution of and flow of the fluid comestible prepared, and hence, particularly in the case when substances are extracted, to enable efficient extraction of the substance and obtaining a quality uniform extract which is reproducible.

In one variant of the process and apparatus, the cartridge tear face tears may be produced in a central part of cavities (orifice recesses), which may be formed between smoothed, arcuate projecting members of a relief surface element, by reason of the material deforming until it reaches its breaking stress. In this case, projecting members may, for example, surmount the grille. The tears continue inside cavities between the members above a zone comprising removal orifices. The material of the tear face thus liberated closely follows the shape of the projecting members under the effect of the pressure exerted. The deformation and displacement of tear face material results in an enlargement of initial tears distributed uniformly over the tear face of the cartridge. These openings thus enable the extracted fluid to flow through and from the layer of coffee grounds, or other substances, while, at the same time, inhibiting solid phase substance from being carried outside the cartridge, which is facilitated also by the solid phase substance being compacted previously under the effect of the pressure.

In a second variant of the process and apparatus, the relief surface members may be accentuated to have a pointed or more sharpened nature so that tearing of the tear face of the

cartridge is initiated at the relief surface element members and continues into the center of cavities (orifice recesses) formed between the elements.

In a third variant of the process and apparatus, the tear face may be opened by the breaking stress of the tear face being reached at the location of members of the relief surface element, which are optionally associated with complementary members, which are not intended to tear the tear face of the cartridge but rather to deform and operate to promote liquid flow to openings and facilitate the cleanness of the system. The fluid passes between the torn and deformed parts of the tear face of the cartridge up to the flow openings because these torn parts are not pressed against the projecting members in an entirely fluid-tight manner because of a certain relative rigidity due to their fairly reduced dimensions.

In an embodiment of the apparatus, relief surface element projecting members may be in a form of rodlets which may be rectilinear, or slightly sinuous, or in a form of optionally closed arcs which may have differing lengths and which may be arranged radially, concentrically, parallel, or perpendicularly to provide for substantially homogeneous flow fluid. Their cross-section defining projecting members may be semicircular, or substantially trapezoidal, more or less flat, more or less widened downwards. Both their cross-section width and their height may be from about 0.05 mm to about 5 mm. The number of arranged rodlets may be preferably from four to sixteen, depending on the size of the flow grille, and preferably the relief surface element provides for from 4 to 50 tears in a tear face of a cartridge.

In a case of a radial arrangement of relief surface members, the rodlets may vary in length, for example, according to their position with respect to the grille surface, normally by from about 0.3 to about 1 times the grille surface size. Some may extend to a position as far as the center of the flow screen grille, while others may stop at a distance of from about 3 mm to about 8 mm therefrom. Such an arrangement is advantageous by reason of the fact that, if all of the rodlets were same length, these elements, by uniting at the center, would form a full circle which would inhibit desirable tearing of the tear face of the cartridge in a central zone and which, in addition, would prevent the fluid from being removed in that zone and thus present a dead zone.

In the case of a concentric, parallel, or perpendicular relief surface element member arrangement, the distance between the members is preferably about the same in the two axes of a horizontal plane.

In any arrangement and positioning, the members should not be situated at a distance below a minimum, which, among other variables as will be appreciated by one of ordinary skill, can depend upon the particle size of a material being extracted, for example, and which may be empirically determined. This, as one of ordinary skill will appreciate, is because, if the elements are too close together, the tear face material may be unable to deform correctly and follow the shapes of members of relief surface element. This would result, during deformation under the pressure, in a danger of coffee grounds, for example, being carried beyond the tears formed in the tear face up to the so-called dead zones. Thus, the members of the relief surface element should be arranged so that dead zones are substantially avoided so that, again, uniformity of extraction flow is achieved.

In another particular embodiment, relief surface element members, at their base, may define circular or ovoidal cavities at a position adjacent flow orifices of the grille. The

depth of such cavities may be from such as about 0.5 mm to about 5 mm. The walls defining such cavities may be in a form of surfaces which are curved over all or over a part of their height or inclined faces to form an angle of from about 5° to about 30° with respect to a plane perpendicular to the surface of the relief surface element.

In other embodiments, relief surface element projecting members may be in a form of small prisms, truncated pyramids, cylinders, or frustums of optionally polygonal or circular cross-section.

In any of the above embodiments, a profile of projecting elements may have smoothed angles or be rounded so that the material of the tear face of the cartridge does not tear directly against the angles, but rather in preferential zones defined between projecting elements.

In the variants, relief surface element projection elements may form an integral part of a plate formed with filtration orifices through which the coffee flows which is advantageous particularly with the first three variants discussed above. On the other hand, the relief surface element may be in a separate piece and comprise parts projecting and recessed in relation to its main surface and orifices through which liquid may flow.

In an additional embodiment, the relative arrangement of the relief surface element and its orifices may be reversed in that the relief surface element is in one piece and comprises parts recessed in relation to its main surface and flow orifices formed at least within projecting members.

In a still further embodiment, the projecting members may be in a form of truncated pyramids, which are preferably orthogonal, and have an edge length of from about 1 mm to about 5 mm and a height of from about 0.5 mm to about 3 mm and be arranged in the form of a grid of which the spacing is usually from about 3 mm to about 7 mm. The substantially flat edges preferably form an angle of from about 10° to about 30° with the vertical. The pyramids are advantageously associated with complementary elements which are not intended to tear the tear face of the cartridge, but rather to promote the flow of the extracted fluid while retaining the grounds, for example in the form of from about 0.2 mm to about 1 mm wide ledges which surround the pyramids and about 0.7 mm to about 1.5 mm wide and about 0.3 mm to about 0.8 mm deep channels at the base. These channels are formed with flow orifices, preferably from about twelve to about fifty in number and preferably are gauged to a diameter of a few tenths of a millimeter.

Upper surface faces of the pyramids act as a support surface when the cartridge is subjected to the effect of pressure. Tearing begins on the edges of the upper faces of the pyramids. These edges should be carefully formed, with respect to the breaking stress of the material of the tear face, because if they are too cutting, the opening pressure may be too low whereas, if they are too rounded, the tear face of the cartridge might be torn unevenly at the channels formed with the flow orifices, and deposits of coffee grounds might be formed therein. The depth, width, angles and surface quality of the channels therefore may be determined so that the material of the tear face of the cartridge undergoes deformation without tearing in this zone. In general, the flow orifices are of optionally circular cross-section and are positioned preferably at the intersections of the channels and are usually conical in shape and widen downwards in order to avoid their inadvertent obstruction by particles of coffee grounds.

In the foregoing embodiment, the infusion passes between the torn and deformed parts of the tear face of the cartridge

and the ledges of the pyramids and flows along the bottom of the channels to the orifices, because these torn parts cannot be pressed against the relief in perfectly fluid-tight manner because of a certain rigidity due to their fairly reduced dimensions, the narrow width of the ledges, the width and depth of the channels, the fairly sharp angles of the ledges and the intersections of the channels.

It also is pointed out that the surface of the walls of the pyramids should be smoothed to assist in avoiding coffee grounds, or other extracted substance, adhering to the walls when the cartridge is removed after extraction. This effect can be also dependent on the angle of slope of the lateral faces of the pyramids, and this angle is important for facilitating the release of the cartridge after extraction by simple inversion of the cartridge holder.

Again, in general, the dimensions and shapes of the members of the relief surface element in all the embodiments are dependent on the characteristics of the product to be infused and the dimensions and shapes are also dependent on the constituent material of the tear face of the cartridge. Moreover, the dimensions and shapes may be adapted to dimensions and shapes of a tear face which need not necessarily be flat. Thus, as will be apparent, arrangement and shaping of the relief surface element members, i.e., sharp or pointed, or rounded, for example, may readily be adapted to a particular breaking stress of a tear face material. As also should be appreciated, the combination of holder means and relief surface element should enable positioning of a cartridge tear face spaced from the relief surface element at a distance which is not so great to prevent contact of the face upon deformation with the relief surface element.

Further, in view of the foregoing, the cartridge openings should not cause an excessive loss of pressure, and it is preferred that pressure loss be resultant through the layer of coffee. However, a minimum pressure loss should be accepted at the openings for the purpose of accelerating an infusion either to form an emulsion or to form a froth typical of an espresso coffee.

For cartridges in the form of inverted frustums (such as shown in FIG. 12), a further apparatus system of the present invention comprises a water injector means, a detachable cartridge holder support means held beneath the water injector means by fixing means, a cartridge holder means and base, as discussed above, disposed in the cartridge holder support, the inner shape of the cartridge holder preferably closely following the outer shape of the cartridge to be extracted, and wherein a peripheral surface part of the water injector means cooperates with a periphery of the cartridge holder to keep the cartridge in position and to ensure fluid-tightness during the extraction process.

The water injector means may include a single injector element having a point or a system of the shower-type. The water, optionally together with a gas such as air, may be ejected from injector orifices at an angle ascending with respect to a plane defined by the flow grille, or may be injected downwards towards the flow grille into the substance to be prepared into a beverage, or both.

In another embodiment of the system according to the invention, which is similar to that of the so-called bayonet-type known to be used in espresso machines, the cartridge holder support means may comprise a handle and fastening lugs, preferably two to three in number, designed to fit onto cooperating ramps of a tightening ring integral with the machine forming a fixing means. Manipulated by means of its handle, the support makes an ascending or descending rotary movement.

In another arrangement, the cartridge holder means may be integral with an automated mechanical unit which, by known secondary means, provides for introduction of a cartridge in a hollow annular extraction element, fluid-tight locking and then, after infusion, unlocking and release of the used cartridge. The arrangement of the respective elements is thus modified, and the tear face, for example, may be disposed in a vertical plane. The same applies to the relief surface element so that the water optionally may be injected perpendicularly thereto.

In this latter arrangement, the lower part of the annular element keeps the arrangement fluid-tight during the extraction process by pinching the rim of a cartridge against the periphery of the cartridge holder means during positioning of the assembly formed by the cartridge holder, the cartridge holder support and the cartridge.

The present inventions also are characterized by a particular shape of a sealing system designed to promote the release of the cartridge after use. As already mentioned, the usually circular rim of a cartridge is pressed between a lower part of an annular element which surrounds the cartridge and a periphery of the cartridge holder. If this rim is fairly thick, either through the use of thick materials or because of the extra thickness due to the crimping of the two parts of the cartridge to form the rim, sufficient fluid-tightness is achieved readily for extraction by pressing the rim flat with moderate effort. If, on the other hand, the rim is thinner, or to avoid problems of tolerance in the manufacture of the elements, it is preferred to provide a particular system designed to ensure fluid-tightness.

In an embodiment of a sealing system of the present invention, an outer lower face of the recessed annular element has a conical edge. A cooperating conical part faces it at a periphery of the cartridge holder. The two parts engage in one another, pinching the rim of the cartridge. The cones each form an angle of from about 30° to about 60° with the vertical, this angle preferably being different for each of the two cones limiting the theoretical contact zone to a circular ridge.

In another embodiment of the sealing system, the conical edge of the recessed annular element is situated on the inner lower part. The slope of the cones is thus reversed so that the periphery of the cartridge holder widens downwards.

In a variant of the second embodiment of the sealing system, the peripheral zone of the cartridge holder means is provided with a conical lip in addition to that responsible for fluid-tightness, but sloping in the opposite direction, the effect of which is to push back the extreme lip of the cartridge through the elasticity of the constituent material of that lip.

In these two embodiments, the part integral with the cartridge holder may comprise an element having a certain elasticity designed to compensate for the effect of production tolerances.

In an additional embodiment of the sealing system, a lower part of the annular element presses the lip of the cartridge against an elastic O ring positioned at the periphery of the cartridge holder.

These arrangements are preferred because, apart from the fluid-tightness which they provide, they facilitate the removal of the cartridge from the relief surface element after extraction by utilizing the residual elasticity of its lip which is deformed during locking.

In cases where the support is released from the cartridge holder by a rotary bayonet-type movement, the cartridge remains intact both during locking and during unlocking of

the cartridge holder because it can be formed by two main parts which, in a preferred arrangement, are designed to rotate relative to one another, the two parts being the cartridge holder comprising the relief surface element and the grille, on the one hand, the support of the cartridge holder comprising a handle, an outlet orifice for the substance and the diametrically opposite fastening lugs, designed to fit onto the tightening ramps of the tightening ring, on the other hand.

The support of the cartridge holder with its handle undergoes an ascending or descending rotary movement which enables the cartridge to be locked or released. The cartridge holder itself does not rotate, but only makes the ascending or descending movement when or as long as the cartridge adheres to the recessed annular confining element.

In a preferred embodiment of the system, the relief surface element and a sealing cone comprises a lip of which the lower part is in the form of a convex spherical ring of which the center of curvature coincides with an axis perpendicular to the plane of the supporting surface of the cartridge, this spherical lip bearing freely on a seat having a concave surface of the same curvature which is integral with the cartridge holder support and which is preferably made of a material having a low coefficient of friction. The result of this is that the arrangement forms a swiveling assembly. The relief surface element is able to rotate on the above-mentioned seat both during introduction of the unit equipped with a cartridge and during its removal. In addition, this part is able to assume a slight inclination, enabling it to compensate for the inevitable mechanical tolerances of the various components of the assembly and to adapt itself in fluid-tight manner to the rim of the cartridge pressed onto the lower periphery of the part responsible for confinement of the cartridge.

In a modified embodiment, the spherical seat is directly integrated with the support of the cartridge holder.

After the cartridge has been used and in order to facilitate its release, a ring held by a spring may be provided on the outer part of the annular element surrounding the cartridge, the lower part of this collar pushing back the rim of the cartridge when the cartridge holder is released.

In cases where an O ring is responsible for fluid-tightness, the coefficient of friction of the O ring against the rim of the cartridge is sufficient to entrain the cartridge during locking and above all during unlocking without substantial risk of deformation of its extraction face against the relief surface element. The support of the cartridge holder does not necessarily comprise a moving part.

In cases where fluid-tightness is established by conical pinching, a zone peripheral to the pinching zone is preferably roughened to entrain the cartridge as described above. The same effect also may be obtained by the ridges of the indentations of orifices provided at the periphery for the reasons described hereinafter.

A receiving cone for the coffee with a vertical flow channel can be arranged beneath the filtration orifices of the cartridge holder to promote formation of froth by stabilizing and concentrating the flow of coffee. A first cone may be complimented by a second, the function of the first cone, which is situated close to the part comprising the relief, being to break up the jets issuing from the flow orifices and the function of the second cone being to channel the flow towards the final outlet orifice. Both these cones may be formed with perforations, preferably in their upper parts, so that they are able to communicate with the outside atmosphere with the main object being to avoid retention of liquid

after the end of an extraction phase of the infusion, the perforations also contributing to formation of a froth through the air which they introduce.

At a periphery of the cartridge holder means and beyond a supporting zone of the cartridge, indentations or orifices may be provided for the removal of water and coffee grounds emanating from the possible discharge from the cartridge through its upper opening after extraction. The flow of water and coffee grounds in question are thus guided through one or more orifices complementary to the orifice intended for the fluid or infusion without soiling that orifice or the inner upper part of the cartridge holder. In any event, this particular flow takes place after extraction of a substance during release of the cartridge. The liquid does not flow into the cup, but usually into a tray covered by a grill on which the cup stands and which may be provided for that purpose. This double exit ensures that the coffee grounds which have been able to remain inside the cartridge holder means are not carried over into a new cup during extraction of the following cartridge. Of course, other pathways for this waste may also be provided to take it to a suitable receptacle.

The invention is described further with reference to the accompanying drawing Figures.

BRIEF DESCRIPTION OF THE DRAWINGS

FIGS. 1-3 diagrammatically illustrate three embodiments of a sealed cartridge according to the present invention.

FIG. 4 is a plan view of a cartridge holder and its support.

FIG. 5 is a section, through a cartridge in the extraction system on the line 5-5 of FIG. 4.

FIG. 6 is a section through the cartridge holder and its support on the line 5-5 of FIG. 4.

FIGS. 7a to 7d are sections through the radial elements on the line 7-7 of FIG. 4.

FIG. 8 is a section through a cartridge in an extraction system in a second embodiment of the invention.

FIG. 9 is a section through a cartridge holder and its support in another embodiment.

FIG. 10 is a plan view of projecting elements used in the cartridge holder shown in FIG. 9.

FIG. 11 is a diagrammatic section through a cartridge in an extraction system in another embodiment.

FIG. 12 is an enlarged view of a profile of the relief and recessed elements of the cartridge holder shown in FIG. 11.

FIG. 13 is a section through a cartridge holder in another embodiment.

FIG. 14 is a section through a system according to the invention for extraction of cartridges in a shape of inverted frustums.

DETAILED DESCRIPTION OF THE DRAWINGS

FIG. 1 illustrates a cartridge (1) formed by a cup (2) having a base (5) and a frustoconical sidewall (6) which extends from the base to a lip (7) which extends laterally away from the sidewall about a cup opening, the opening deemed herein to be defined by an edge extent of the sidewall away from the base. The opening is covered by a tear face cover (4) sealed to the lip and which has a thickness less than that of the cup base and wall. The diameter of the opening is greater than a diameter of the base. The cartridge contains a substance (3).

FIG. 2 illustrates a cartridge (1) having a cup (2), as shown in FIG. 1, except that the lip (7) of the cup is wider and is folded over and crimped to cover (4) about the periphery of the cover.

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FIG. 3 illustrates a cartridge (1) having a cup (2), as shown in FIG. 1, and a multilayer cover (4a, 4b) which is folded over and crimped to the lip (7).

Referring to FIGS. 4-6, the cartridge holder (11) comprises a flow grille (12) with relief surface element members (13) and an annular chamfered rim (14). This rim forms an angle alpha with the vertical.

The cartridge holder (11) is accommodated in its support (15) which has a handle (16), a lateral wall (24) which has two diametrically opposite fastening lugs (17) designed to fit onto tightening ramps (10) of a tightening ring (9), as illustrated in FIG. 5, and a bore (27) for the passage of extracted coffee beverage. Provided on the base (25) of the support (15) is an annular protuberance (26) upon which rests the cartridge holder (11), which is able to turn in its support by virtue of two removable pins (18) which cooperate with a groove (19) formed in the cartridge holder.

Referring to FIG. 5, the extraction system further comprises a water injector (20) formed with upwardly directed orifices (20a) and an annular element (21) with an internal recess of which the shape substantially corresponds to the outer shape of the cartridge. The upwardly directed orifices enable injecting water at an ascending angle away from the extraction cover face (4) which enables thoroughly wetting the entire layer of coffee. On its outer part, the annular element (21) comprises a spring (22) holding a ring (23) for releasing the cartridge on completion of extraction.

In operation, a cartridge (1) is placed in the cartridge holder (11). The support (15) then is fixed by its fastening lugs (17) onto the tightening ramps (10) of the tightening ring (9). The water injector (20) pierces the base face of the cup (2). The cover tear face (4) of the cartridge rests on the radially arranged members (13) of the cartridge holder. The fact that the cartridge holder (11) can be rotated in its support (15) ensures that the cartridge remains fixed in relation to the cartridge holder during locking and unlocking, thus avoiding risk of damage to the cartridge.

The water is introduced through the orifices (20a) of the water injector (20) and impinges on the layer (3) of coffee. The pressure in the cartridge increases and the tear face (4) increasingly follows the shape of the radial opening relief surface members (13). When the constituent material of the tear face reaches its breaking stress, the tear face tears along the radial members. The extracted coffee flows through the orifices of the flow grille (12) and is recovered in a container (not shown) beneath the bore (27).

FIGS. 7a to 7d show different shapes for embodiment of radial relief surface element members (13) integrally with a flow screen grille (12). FIGS. 7a and 7b illustrate a rounded element. FIG. 7a illustrates an element having a flattened surface and curved edges. FIG. 7d illustrates a cross-section of an element which is pyramidal in shape having a flattened top surface.

In FIG. 8, elements identical with those in FIG. 5 are denoted by the same reference numerals. The system illustrated in FIG. 8 differs from that shown in FIG. 5 solely in the elements participating in the rotation of the cartridge holder (11) relative to its support (15). The cartridge holder is held in its rotation cavity by means of a ring (31) which may be welded, or crimped, or screwed to the support after introduction of the cartridge holder.

In FIG. 9, the cartridge holder (40) differs from that shown in FIG. 6 insofar as it comprises a flow grille (41) having the nature of a screen and, arranged on the screen, a separate relief surface element (44) with projecting members (42) held in position by a ring (43), the cartridge opening function being performed by upper portions of the members (42).

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FIG. 10 is a more detailed top view of the ring (44) and the radially arranged projecting members (42).

In FIG. 11, elements identical with those in FIG. 8 are denoted by the same reference numerals. The system of FIG. 11 differs from that shown in FIG. 8 in the fact that the cartridge holder (60) is in one piece and also forms the support of the cartridge holder. The cartridge holder comprises a plate (51) with relief surface element projecting members in a form of pyramids and filtration orifices, a coffee receiving cone (52) and openings (53) at the edges for removing the extracted coffee substance through an auxiliary orifice (54). The annular part (61) of the cartridge holder is responsible for fluid tightness by pinching the rim of the cartridge to be extracted against the lower part of the annular element (21).

FIG. 12 is a detailed section through the plate (51), showing inclined faces (55) of pyramids which may form an angle of from about 10° to about 30° with the vertical, ledges (56) and flow channels (57) comprising orifices (58).

FIG. 13 is a section through an embodiment comprising a relief surface element (67) having a conical sealing surface (68) and a spherical supporting surface (62) of which the center of curvature coincides with the axis (63) perpendicular to the plane of the relief element, the angle of slope of the tangent to this ring being approximately 45°. A seat (64) comprises a spherical supporting surface (65) in contact with the corresponding supporting surface of the element (67). The seat (64) is integral with the support of the cartridge holder (not shown). It is preferably made of an alloy or injection-moulded plastic material and, at its periphery, comprises pins (66) which enclose the element forming the supporting surface while leaving sufficient room for the element to be able to turn freely and to slope to a sufficient extent. In addition, the support of the cartridge holder (not shown) has sufficient radial play so that if it is fixed to a bayonet, it allows the arrangement as a whole to be centered despite off-centering of the element comprising the relief surface and the sealing cone during its swiveling movement.

In FIG. 14, elements identical with those in FIG. 8 are denoted by the same reference numerals. The system illustrated by FIG. 14 differs from that shown in FIG. 8 in the respect that the cartridge to be extracted is in the form of an inverted frustum (70) and, accordingly, does not have an annular element (21). The cartridge holder and its support are in one piece (71). The periphery of the cover face (72) of the cartridge is pinched between the extraction head and an upper part (75) of the cartridge holder. The tear face (73) of the cartridge bears against the relief surface element (74), which may have members in a shape of a pyramid. The mode of operation is substantially the same as for FIG. 5. Water arrives under pressure through the water injector (20) and passes through the layer of coffee in the capsule. The pressure in the capsule rises and presses the tear face (73) against the projecting members of relief surface element (74). When the breaking stress is reached, the tear face (73) tears against the pyramid members (74) and the coffee beverage flows through the annular orifice (78) via the orifices (76) and the coffee receiving cone (77).

As is clear from the foregoing, various modifications of the present invention may be without departure from the spirit and scope of the disclosure, and the invention may be practiced suitably in the absence of elements not specifically disclosed herein and which may be excluded.

I claim:

1. A sealed cartridge for preparation of a beverage by extraction of the substance under pressure comprising a cup

and a cup cover sealed to the cup and roast and ground coffee substance contained by the cover within the cup, there being no marks in the cover for weakening the cover and there being no filter member contained within the cup and cover, and wherein:

the cup comprises (a) a base, (b) a sidewall which extends from the base to an edge about a cup opening which opposes the base and (c) a lip which extends laterally away from the sidewall edge and the opening;

the cover extends across the opening to the lip and is sealed to the lip so that the roast and ground coffee substance is contained within the cup by the cover;

the cup and cover are substantially impermeable to oxygen; and

the thicknesses of each of the cup base, sidewall and lip being greater than the thickness of the cover, and

the cover has a thickness and a breaking stress so that upon placement of the sealed cartridge in an apparatus for brewing a beverage under pressure, wherein the sealed cartridge is positioned in a holder of the apparatus and the cover is adjacent projections of the apparatus for forming a plurality of openings in the cover which allow flow of coffee beverage extracted from the roast and ground coffee substance through the cover and which restrict roast and ground coffee substance escape from within the cartridge via the openings, and upon injection of water under pressure within the cartridge and into the roast and ground coffee substance positioned in the holder so that pressure within the cartridge increases to within a range of from 2 bar to 15 bar, the cover initially deforms and portions of the cover contact and press against the projections and the water wets and compacts the roast and ground coffee substance and then, subsequently, at a pressure

within the range of from 2 bar to 15 bar, the cover portions pressed against the projections reach their breaking stress, break and form the plurality of openings for coffee beverage flow and for restricting the roast and ground coffee substance escape through the cover via the openings.

2. A sealed cartridge according to claim 1 wherein the roast and ground coffee substance is suitable for preparation of an espresso coffee beverage.

3. A sealed cartridge according to claim 1 wherein the cup and cover are aluminum.

4. A sealed cartridge according to claim 3 wherein the base, sidewall and lip thicknesses are from about 90 μm to about 110 μm and wherein the cover thickness is from about 20 μm to about 40 μm .

5. A sealed cartridge according to claim 4 wherein the sidewall is substantially frustoconical in shape and wherein the opening diameter is greater than the base diameter.

6. A sealed cartridge according to claim 1 wherein the base, sidewall and lip thicknesses are at least 60 μm and the cover thickness is from about 5 μm to less than 50 μm .

7. A sealed cartridge according to claim 6 wherein the sidewall is substantially frustoconical in shape and wherein the opening diameter is greater than the base diameter.

8. A sealed cartridge according to claim 1 wherein the sidewall has a substantially frustoconical shape and wherein the opening diameter is greater than the base diameter.

9. A sealed cartridge according to claim 1 wherein the cover and lip are crimped so that the cup and cover are sealed.

10. A sealed cartridge according to claim 1 wherein there are no marks in the base for weakening the base.

* * * * *

EXHIBIT D

[54] CAPSULE FOR BEVERAGE PREPARATION

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[21] Appl. No.: 858,347

[22] Filed: Dec. 7, 1977

[30] Foreign Application Priority Data

Dec. 17, 1976 [CH] Switzerland 15913/76

[51] Int. Cl.² B65B 29/02

[52] U.S. Cl. 426/77; 99/295; 206/0.5; 426/115

[58] Field of Search 426/77, 78, 79, 112, 426/115; 206/0.5; 99/295, 305

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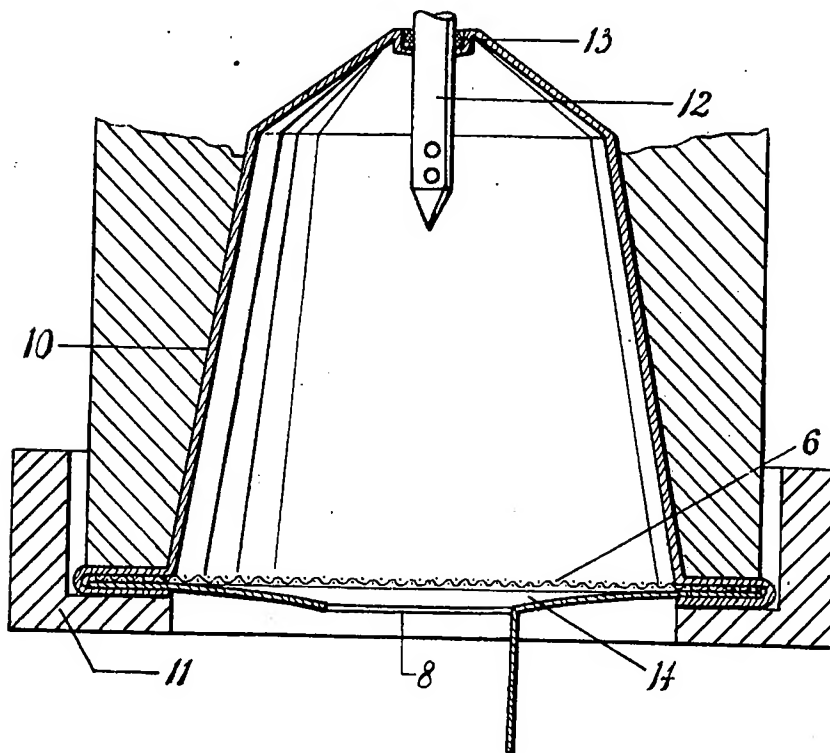
Primary Examiner—Steven L. Weinstein

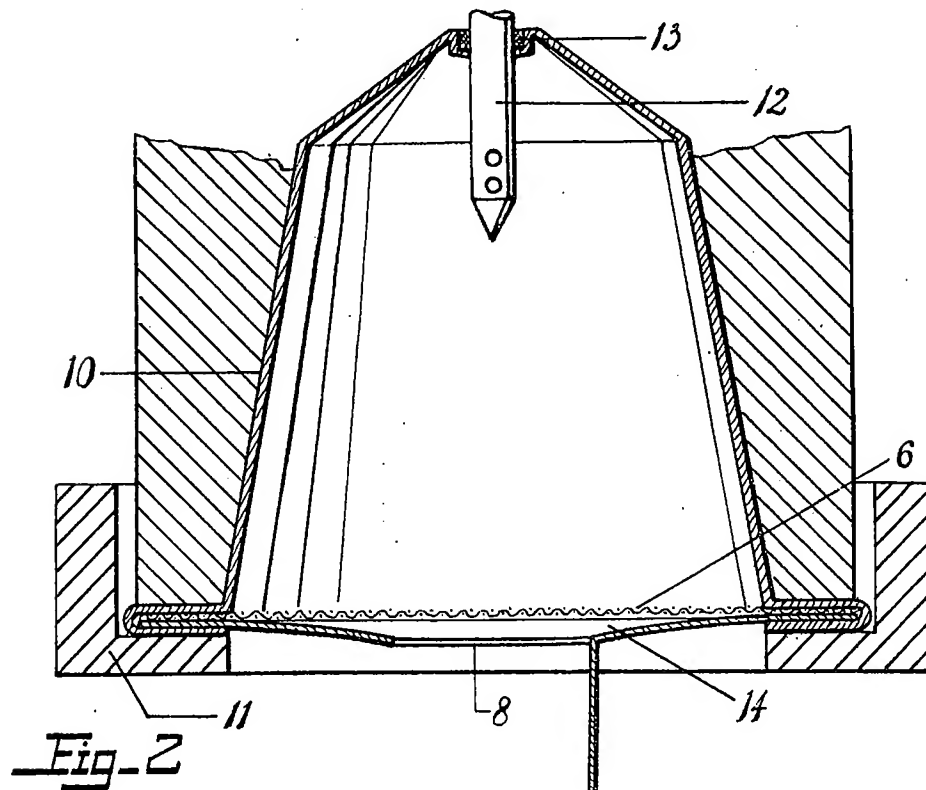
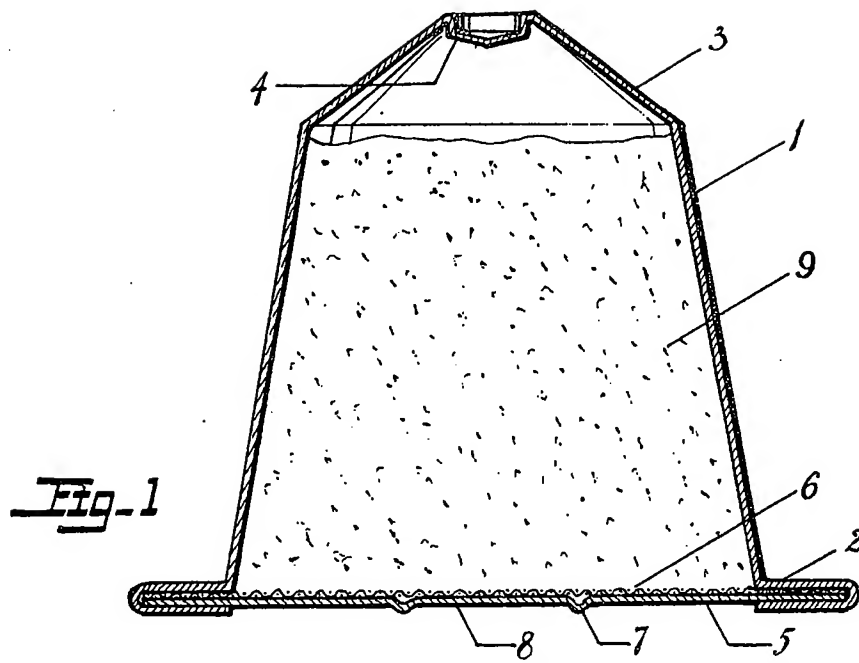
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[57] ABSTRACT

A capsule containing a substance for making up a drink using an apparatus, said capsule being composed essentially of a sealed body having the general shape of an acute truncated cone with a rim at its base and of a membrane closing the base, said membrane being provided with a line of weakness delimiting an aperture.

2 Claims, 2 Drawing Figures





CAPSULE FOR BEVERAGE PREPARATION

The present invention relates to a capsule containing a substance for making up a drink using an apparatus.

Capsules of this type do exist and they are of a general cylindrical and flat shape, are composed of air-tight material to protect their content from external influences and are intended to be perforated on their two opposing faces when in use. They have the disadvantage of a low resistance to crushing when being perforated.

It has also been suggested that only one wall be pierced, that the liquid intended for making up the drink be injected into the capsule from one side and that the opposite wall be torn by the pressure of the injected liquid. This mode of operation affords the advantage of better mixing with the content of the capsule and, if necessary, of making the liquid penetrate the granules contained in the capsule, for example, in the case of ground coffee. However, the liquid flows out through the tear at random. In fact, as the liquids are practically incompressible, the slightest crack is sufficient to cause a drop in the internal pressure so that the orifice no longer increases in size and is irregular in shape.

The capsule according to the invention obviates these disadvantages. The present invention provides a capsule containing a substance for making up a drink using an apparatus, the capsule being composed essentially of a sealed body having the general shape of an acute truncated cone with a rim at its base and of a membrane closing the base and delimiting a cover, the membrane being provided with a line of weakness.

The features and advantages of the invention will be shown in the description below with reference to the accompanying drawings, given as non-limiting examples.

FIG. 1 is an axial section through an embodiment of a capsule according to the invention.

FIG. 2 shows the capsule in FIG. 1 in use.

In the drawing, the capsule comprises a body 1 composed of sheet aluminium between 60 and 110 μ thick, preferably 80 μ , having the general shape of an acute truncated cone with a rim 2 at its base. The conical shape in relation to the axis is from 2 to 20°, preferably about 10° (that is to say a 20° angle at the vertex). Better resistance to crushing is thus obtained and it is easier to remove the capsule from its housing after use.

The body 1 terminates at its smallest end with an obtuse cone 3. As a variation, this end is dome-shaped. It has a substantially cylindrical recess 4. In a preferred embodiment, the bottom of this recess is weakened.

The rim 2 is formed by pinching the body around a membrane 5 closing the base and, in the example shown, a filter 6 adjacent to the membrane 5. In a preferred embodiment, the body and the membrane are thermosealed.

The membrane is composed of aluminium, preferably between 30 and 60 μ thick. As a variation, it has radial grooves making it more readily deformable. It comprises a line of weakness 7 consisting of a stamped out groove of general circular shape. In a preferred embodiment, this line is not closed but is C-shaped or horse-shoe-shaped.

The capsule is filled with a substance 9 for making a drink which is ground coffee in the example shown but could be tea, instant coffee, a mixture of ground coffee and instant coffee, a chocolate product, etc.

The filter 6 is composed of metal or plastic. In the case of ground coffee, good results have been obtained using a sieve composed of polypropylene with orifices of between 40 and 60 μ , between 2 and 8% of the total surface being a passage surface. This filter is not essential if the capsule contains a completely soluble substance.

When in use (FIG. 2), the capsule is placed in a housing 10 of an apparatus of conventional type for preparing drinks, such as so-called "expresso" coffee machines. The capsule is held in the housing 10 by a fixing member 11 secured to the apparatus by a bayonet fitting. Since the conical shape of the housing 10 corresponds to that of the body 1, the grip of the member 11 holds the capsule well and contributes to its resistance to internal pressure.

When the capsule is positioned in the housing 10, its vertex is perforated by an injecting member 12 of the apparatus while a packing ring 13 is placed in the recess 4 in the capsule. The liquid for making up the drink is then injected under pressure by the member 12 into the capsule and mixes with the substance 9. The pressure may be relatively high and may attain about 16 bar.

This pressure initially causes the membrane 5 to expand and finally to break along the line of weakness 7.

A determinate aperture 8 opens through which the drink flows uniformly. It will be observed that the convex shape of the membrane 5 forms beneath the filter 6 a collecting chamber 14 which distributes the flow evenly over the cross-section of the capsule and the filter 6.

When the attenuated line 7 is not closed, i.e. does not form a closed circle, the wall which closed the aperture 8 is not completely detached from the membrane 5 and does not risk falling into the cup, for example.

Finally the drink flows directly through the aperture 8 into the receiving vessel. The fixing member 11 may be merely annular with neither a collecting chamber nor an outlet nozzle necessitating frequent and laborious cleaning.

I claim:

1. A capsule containing a substance for making up a drink using an apparatus of the type which includes a water-injection piercing member which injects water into the capsule under pressure, said capsule being composed essentially of a sealed impervious body containing said substance and having the general shape of an upright acute truncated cone, the top of the body terminating into a generally domed end, said domed end having a recess for receiving said water-injection piercing member, the height of said body being approximately the same as the base dimension thereof, said body being provided at said base with an outer rim, a membrane defining a base closure member, and a filter interposed between said membrane, and said substance said membrane being resilient and bulging outwardly under the pressure of water injected into said capsule through said piercing member, said membrane being provided with an integral portion at least partially surrounded by a grooved line of weakness which brakes away from said membrane under the influence of the water pressure when said membrane is in bulged condition thereby forming an aperture in the membrane through which the drink will flow from the capsule.

2. A capsule according to claim 1, in which said membrane is provided with radial grooves for facilitating outward bulging of said membrane.

* * * * *

EXHIBIT E

[54] COFFEE MACHINE

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[21] Appl. No.: 33,815

[22] Filed: Apr. 27, 1979

[30] Foreign Application Priority Data

May 3, 1978 [IT] Italy 21703/78[U]

[51] Int. Cl.³ A47J 31/14; A47J 31/36

[52] U.S. Cl. 99/281; 99/295

[58] Field of Search 99/295, 302 R, 302 P,
99/303, 279, 280, 281, 282, 283

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Primary Examiner—Robert W. Jenkins

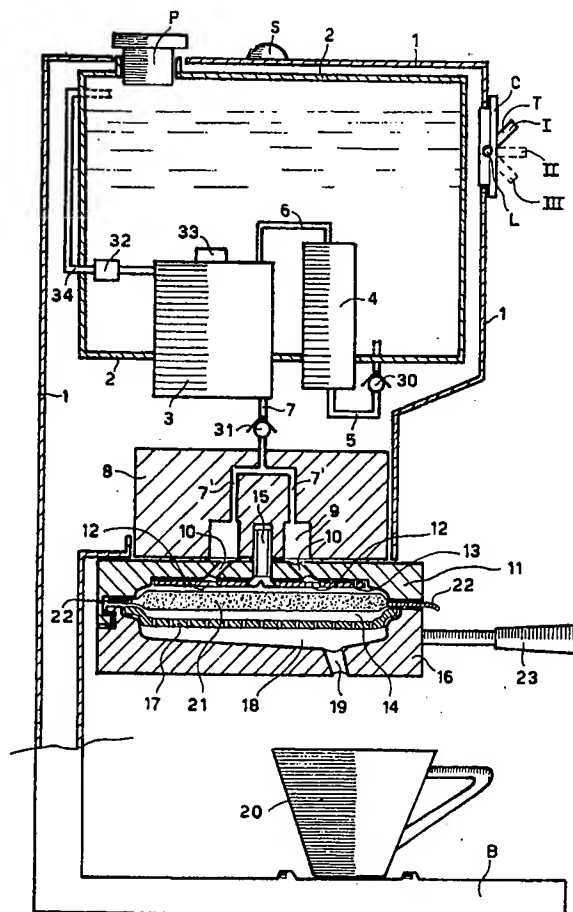
Attorney, Agent, or Firm—Karl H. Gross

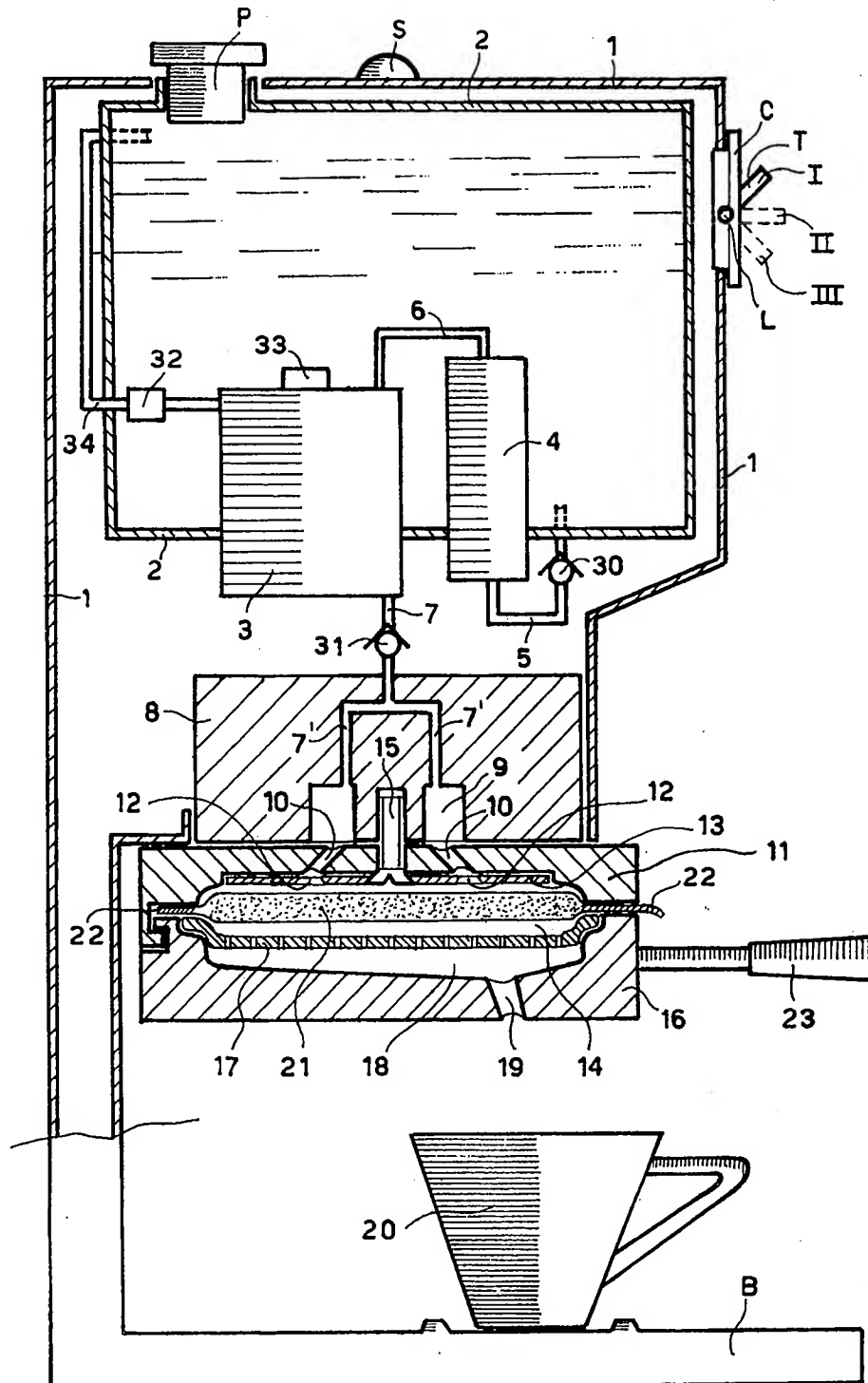
[57]

ABSTRACT

The invention relates to a coffee brewing machine which is particularly suitable for family use and for a small commercial establishment, such as a refreshment room. The machine extracts the coffee beverage from a pod which contains ground coffee and is housed in a chamber defined by an upper block and by a removable lower box, between a jet-forming member fixed to the upper block and a filter housed in the removable lower box. It includes a water container, a heater and a pump which supplies the water to the chamber at the proper temperature and pressure. In the chamber the water penetrates the pod and extracts the coffee beverage therefrom and then the coffee beverage flows out of the machine.

9 Claims, 1 Drawing Figure





COFFEE MACHINE

BACKGROUND OF THE INVENTION

1. Field of the Invention

The present invention relates to a coffee machine.

More particularly, the invention is concerned with a coffee machine which is especially well suited for domestic use and for small commercial establishments, i.e. for applications where relatively small quantities of coffee are consumed during any given period of time.

2. The Prior Art

Coffee machines, i.e. machines for brewing coffee, are well known both for large-scale applications (large commercial users) and for small-scale applications (households; small commercial users). By contrast to percolators and analogous devices these machines—known as “espresso machines”—all operate on the principle that a user places a quantity of ground coffee from a supply into a filter, whereupon a stream of hot water is passed through the coffee to become converted into coffee beverage.

There is nothing wrong with the mechanical performance of these machines. They do, however, have a variety of undesirable characteristics which make them less than perfect for use in households and small commercial establishments. In particular, the coffee grounds must be removed from the filter after brewing, and the filter be washed; this causes dirt and disorder. Coffee must first be placed into the filter from a supply, and the grounds must subsequently be removed and the filter cleaned; this is time-consuming and especially the removal of the grounds and cleaning of the filter is often considered to be an onerous chore.

Moreover, with these known machines it is not possible to assume that the taste of the coffee beverage is uniform from one time to the next, because the quantity and quality of ground coffee used, the degree of compaction of the ground coffee in the filter (which influences the flow rate of the water and the extraction of aromatics) and the handling of the machine itself are all factors which are not constant.

SUMMARY OF THE INVENTION

Accordingly, it is an object of the invention to overcome the disadvantages of the prior art.

More particularly, it is an object of the present invention to provide an improved coffee machine which is not possessed of the prior-art disadvantages.

Another object is to provide an improved coffee machine wherein coffee beverage (one or more cups) is brewed from a pre-measured, pre-packaged quantity of ground coffee which, because of these circumstances, can be of uniform quantity, quality and compaction.

Still a further object is to provide such a coffee machine which brews coffee from pods or cartridges containing a pre-measured quantity of ground coffee.

A concomitant object is to provide an improved coffee machine of the type here under discussion which requires no handling of loose ground coffee or of coffee grounds, needs a minimum of cleaning and of routine maintenance, and which delivers coffee beverages of uniform taste during each instance of use.

Pursuant to the above objects, and still others which will become apparent from a reading of the description following hereafter, one object of the invention resides in a coffee machine which, briefly stated, comprises a housing having a reservoir for water; means on the

housing forming a chamber having an inlet and an outlet and including a removable cover for the chamber; means for removably holding in the chamber a water-permeable cartridge containing a beverage-making substance; electrically energized means for heating water from the reservoir; and means for forcing the heated water under pressure through the inlet and the cartridge in the chamber, so as to brew a beverage which leaves the chamber through the outlet.

Pods or cartridges, where a precisely metered quantity of ground coffee is accommodated in an envelope of water-permeable filter paper, are known. These are made commercially and packed in air-tight containers, either in a vacuum or under an inert protective gas (e.g. argon). At present, such cartridges are made to permit brewing of a single cup of coffee, but it is evident that they can be made larger to brew any desired number of cups of the beverage from each cartridge.

The novel features which are considered as characteristic for the invention are set forth in the appended claims. Both the construction and method of operation of the invention, as well as additional objects and advantages thereof, will however be best understood from the following description of specific embodiments in connection with the accompanying drawings.

BRIEF DESCRIPTION OF THE DRAWING

The sole FIGURE is a somewhat diagrammatic vertical section through a machine according to the invention.

DESCRIPTION OF PREFERRED EMBODIMENTS

Illustrated in the FIGURE is an exemplary embodiment of a coffee machine according to the invention. It has a housing 1 of any desired shape and material. A water container or reservoir 2 (of e.g. metal or synthetic plastic material) is accommodated in the housing 1 to which it is connected in any suitable per se known manner. Housing 1 and container 2 have common inlet openings for the admission of water; the opening can be closed by a plug P.

The casing of an electric resistance heater 3 may, but need not be, partially located in the container 2, in order to conserve space and reduce the overall size of the machine; the resistance heating element of the heater 3 is known per se and therefore not shown. Also known per se is an electrically operated pump 4 which may (but need not) be partly located in the container 2 for the same reasons as heater 3. Pump 4 communicates with container 2 via a conduit 5 in which a one-way valve 30 is interposed; it also communicates with the interior of the casing of heater 3 via a conduit 6.

An operating panel C is accessible at the exterior of housing 1 and in the illustrated embodiment has a switch L provided with a toggle T which can be moved between the positions I, II and III. A flexible electric line cord (not shown) supplies power via switch L to the heater 3, pump 4 and an indicator light S. No circuit diagram is needed to understand this simple electrical circuit.

To operate the machine a user moves toggle T from the rest position I to the position II in which power is supplied to the resistance element of heater 3, causing the element to heat up; at the same time, power is supplied to the lamp S so that the same lights up. A thermostat 33 is connected in circuit with the heater 3 and

pump; when it senses after a few seconds that the water in the casing of the heater 3 has reached the required temperature—usually about 80° to 90° C.—the thermostat interrupts the flow of energy to the heater 3 and also to lamp S. As a result the lamp S is extinguished and thereby signals the user that the water is ready for coffee brewing. The user now moves the toggle T to position III, thereby connecting the pump 4 to the electrical energy source. Water is now drawn through conduit 5 into the suction side of pump 4 and expelled from its pressure side via conduit 6 into the heater 3, in the process displacing hot water from heater 3. The water in heater 3 will be subjected to the requisite pressure—usually about 8–10 atmospheres—almost immediately on start-up of the pump and will be expelled from heater 3 via conduit 7 and through the one-way valve 31, into a distribution block 8.

The block 8 is provided with a plurality of passages 7' (e.g. arranged in an annular pattern) communicating with conduit 7 and with an annular distributing chamber 9. Arranged below the block 8 is a further block 11 formed with a downwardly open recess. A third block 16 is detachably mounted below the lower open side of the recess and in turn provided with an upwardly open recess 18. Together, the two recesses define a filtration chamber 14. A baffle member 13 is mounted in the recess of block 11, by means of a screw 15 which also serves to secure the block 8. The block 11 and member 13 are readily detachable from block 8 to permit periodic cleaning of chamber 9 and the members 11, 13 including ducts 10 in the member 11 which communicates with the branches 7' and openings 12 in the baffle member 13.

The recess in the block 16 is subdivided by a filter 17 into an upper part and a lower part 18 having a bottom wall which slopes down towards an outlet 19. Below the outlet 19 the base B of the machine is provided with a space for standing a cup 20 or other receptacle for the brewed beverage.

Block 16 may be easily connected to and disconnected from, the block 11 by manual manipulation and via means known per se (e.g. a sliding connection or a bayonet coupling), which makes for quick manipulation.

A pod or cartridge 21 (analogous to a teabag) is inserted into the chamber 14 defined by the members 11, 16 so as to be located above filter 17 and below member 13. The edge portions of cartridge 21 are clamped between the engaging surfaces of elements 11, 16 to hold the cartridge in place and to prevent leaking of water from between these surfaces. Additional sealing means known per se, may also be provided for this purpose on the member 11 and/or 16.

Hot water expelled from the heater 3 under the influx of new water being forced in by the pump 4, travels via conduit 7 past one-way valve 31 into the conduit branches 7' and from there passes via distributor 9, passages 10 and openings 12 into the chamber 14, wherein it is forced through the cartridge 21 and becomes converted into the coffee beverage which, after passing through filter 17, runs through outlet 19 into cup 20.

To facilitate removal of member 16 for installation of new and extraction of spent cartridges 21, the member 16 is provided with a handle 23. Valve 31 prevents coffee particles from entering heater 3, pump 4 and the water supply in container 2. A safety valve 32 is provided in a conduit 34 connecting heater 3 with container 2; its purpose is to allow the discharge of water

from heater 3 into the container 2, in the event the water pressure in heater 3 exceeds a predetermined limit (i.e. the response level of valve 32).

The quantity of water supplied to chamber 14 and then passing through the cartridge 21 is proportional to the time period for which the user holds the toggle T in the position III, i.e. the time period during which the pump 4 is energized. Water will stop flowing as soon as toggle T is returned to the position I or the position II. It is advantageous, therefore, if the switch L is of the type (known per se) in which the toggle is spring-loaded and returns to either the position I or the position II when released by the user.

The electric resistance and thermal inertia of the heater 3 are such that sufficient water is kept at the required temperature to permit brewing of as many cups of coffee as the cartridge 21 is capable of yielding (such quantity will, of course, be specified in the instructions). After a cartridge is spent and water in the heater 3 begins to cool, it is merely necessary to set toggle T to the position II; in the short time required to replace the spent cartridge with a fresh one the water in heater 3 will have been heated again to proper operating temperature and the machine will be ready for the next operating cycle.

It will be appreciated that the machine according to the invention meets the objects set forth hereinbefore. It is simple in its construction and operation, easy to clean and eliminates the need for filling in coffee from a supply and later removing the soggy grounds and cleaning the filter. Moreover, and of particular interest to connoisseurs of good coffee, the quality of beverage produced will always be uniform since the amount and compaction of ground coffee will be the same in all cartridges and since the cartridges themselves can be left in their containers (e.g. vacuum-packed) so that all properties of the coffee are maintained unchanged until the moment of use. It will be understood, of course, that the machine can be used to brew beverages other than coffee, for example tea.

While the invention has been illustrated and described as embodied in a coffee machine, it is not intended to be limited to the details shown, since modifications and structural changes may be made without departing from the spirit of the invention.

What is claimed as new and desired to be protected by Letters Patent is set forth in the appended claims.

1. A hot-beverage machine, particularly a coffee maker, comprising

a housing having a reservoir for water;
means on said housing forming a brewing chamber having an inlet and an outlet and including a removable cover for the chamber;

filter means in said chamber intermediate said inlet and outlet thereof;

means for removably holding in said chamber, intermediate and spaced from both said inlet and said filter, a water-permeable cartridge containing a beverage-making substance;

a distributor member removably mounted on said housing and to which said chamber-forming means are connected, said distributor member having one surface provided with an annular recess forming an annular distributing chamber of a first cross-section, and an annulus of distributing passages of second cross-section smaller than said first cross-section and each communicating with said intake and with said annular recess, respectively;

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electrically energized means for heating water from said reservoir; and
means for forcing the heated water under pressure through said intake, said inlet and said cartridge into said chamber, so as to brew a beverage which leaves said chamber through said outlet.

2. A machine as defined in claim 1, wherein said chamber-forming means comprises an upper member mounted on said housing and, a lower member removably mounted on said upper member and constituting said cover.

3. A machine as defined in claim 2, said holding means being constituted by respective juxtaposed edge faces of said upper and lower members between which portions of the cartridge are clamped.

4. A machine as defined in claim 1; and further comprising means adjacent said inlet for directing high-speed jets of the heated water against said cartridge.

5. A machine as defined in claim 1; said heating means including a casing having a compartment for water to be heated and communicating with said intake passage; and wherein said means for forcing comprises pump means communicating with said reservoir and said com-

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partment for withdrawing water from the reservoir and forcing it under pressure between substantially 8-10 atmospheres via said compartment into said chamber.

6. A machine as defined in claim 5; and further comprising means for preventing backflow of water from said chamber into said heating means.

7. A machine as defined in claim 5; and further comprising pressure-relief means for relieving said compartment to said reservoir in the event pressure in the compartment exceeds a predetermined limit.

8. A machine as defined in claim 5; said heating means comprising an electric heater operative for heating water to a temperature of substantially 80°-90° C.

9. A machine as defined in claim 5; and further comprising control means operatively connected with said heating means and pump and including a control element movable between a rest position, a first operating position in which said heating means is engaged, and a second operating position in which said pump is energized and remains energized for as long as said control element is in said second operating position.

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